Course Specifications of: Solar Energy MEP 511

Program(s) on which the course is give: Diploma in Mechanical Power Engineering
(Conventional and Renewable Power Plants)
Compulsory or Elective element of program: Compulsory
Department offering the program: Mechanical Engineering / Power
Academic year / Level: year/ 2014/2015
Date of specification approval: 2012

A. Basic Information

Title: ***Solar Energy*** **Code:** ***MEP 511***
Credit Hours: 3 **Lecture: 3**
Tutorial: **Practical:** **Total; 3**

B- Professional Information

1- Overall aims of course:
This course introduces students to:

1. Design, analysis, and operate of the solar power plants components and compound plants.
2. Engage students in learning about classifications of conventional and non-conventional energy resources.
3. Get new solutions to efficient solar power-generation problems.
4. Know about the treatment and synthesis of electric-generating power plant technology and engineering.
5. Understand the principle analysis of theoretical, experimental, and design of solar thermal system.
6. Identify the differences between Recent Developments In Solar Power Plants.
7. Introduce the Sunshapes and Effective Sunshapes and Solar Irradiance Profile.
8. Make a Thermal Analysis of Parabolic Trough
9. Identify the various kinds of Solar collectors.

2- Intended learning outcomes of course (ILOs)
By completion of the course, the student should be able to:

2.1 Knowledge and understanding

a1. List and discuss principles of solar energy in the area of study of conventional and renewable power plants. (2.1.2)
a2. Demonstrate fundamentals of quality in the solar energy and renewable power plants. (2.1.3)
a3. Explain the effect of solar energy on the environment and work towards its conservation and maintenance. (2.1.4)

2.2 Intellectual skills

b1. Solve study of solar energy power plant problems. (2.2.2)
b2. Assess the risks and hazards in professional practices. (2.2.4)

2.3 Professional and practical skills

c1. Apply professional skills in the area of study of conventional and renewable power plants. (2.3.1)

2.4 General and transferable skills

d1. Communicate efficiently in oral, written and with drawing.(2.4.1)
d2. Use information technology in solar energy to improve the professional practice.(2.4.2)
d3. Work in a group and manage time effectively.(2.4.5)
d4. Lead a team in familiar professional contexts.(2.4.6)

3-Contents

Topic No.	Topic	No. of weeks	Total no. of hours
1	Energy Technology and Energy Sciences	1	3
2	Global Solar Energy Sources- The solar system, solar radiation and solar angles for solar collectors	2	6
3	Existing Solar Collector Technologies	1	3
4	Flat solar collectors - absorption surface - Solar Collector System Calculation	1	3
5	Direct and Diffused beam Optical Analysis	1	3
6	Parabolic Trough and Central Receiver system Introduction	1	3
7	**Mid Term**	1	3
8	Thermal Analysis and calculation for Parabolic Trough	1	3
9	Solar Thermal Power Plant cycles and calculations	2	6
10	Energy storage systems and PCMs	1	3
11	Photovoltaic systems and their Application in Power Generation	2	6
12	**Final Exam**	1	3
13	Total	15	45

4- Course Matrix

ILO's code number	Teaching/learning methods and strategies	Assessment methods and strategies
2.1.2 2.1.3 2.1.4	Formal lectures	Individual coursework assignments, quizzes, oral discussions and reports. Mid year and /or final written examination is given.
2.2.2 2.2.4	Analysis and problem-solving skills are developed through tutorial/problem sheets and small group exercises. Research skills are developed through a small subject oriented research project.	Analysis and problem-solving skills are assessed through oral and written examinations. Design and research skills are assessed through project write-ups, coursework and project reports.
2.3.1	Experiments demonstrations, practical work,	Practical skills are assessed through

	laboratory visits.	laboratory experimental write-ups, coursework exercises and reports, project reports and presentations.
2.4.1 2.4.2 2.4.5 2.4.6	Those skills are not explicitly taught; however, along the course of study the student will acquire those skills to be able to perform his obligations. Attendance of seminars, workshops or conferences will help the student in developing those skills. Presentation by students (either group or individual) will train students for those skills.	Project presentation

5- Assessment schedule

Assessment 1	Assignments	on weeks	1, 3, 6
Assessment 2	Quizzes	on weeks	2, 4, 9, 13
Assessment 3	Mid-term exam	on weeks	8
Assessment 3	Oral exam	on week	14
Assessment 4	Final exam	on week	15

6- Weighting of assessments

20% (60 marks) Home assignments, Quizzes, and reports
20% (60 marks) Mid-term examination and Oral examination
60% (180 marks) Final-term examination
100% (300 marks) Total

7- List of References

7.1 Text books

Course notes Prepared by the instructor:

- "Fundamentals of Renewable Energy Processes", Aldo V. Da Rosa, Stanford University, ELSEVIER Academic Press, 2005.
- "Physics of Solar Energy", C. Julian Chen, John Wiley & Sons, Inc., 2011.
- "Handbook of Energy Engineering, Fifth Edition", Albert Thumann. P.E., C.E.M., D. Paul Mehta, Ph.D., The Fairmont Press, Inc., 2001.

7.2 Websites

* Yahoo scribd.com
* www.sciencedirect.com

8- Facilities required for teaching and learning

Presentation board, computer and data show
Laboratory

Prepared by: Dr. Mohamed Abdel Salam El Desouky

Head of Department: Prof. Dr. Osama Ezzat Abdellatif

Matrix of course content and ILO's

Course Title: **Solar Energy** **Code**: **MEP 511**
Lecture: 3 . **Tutorial**: ---- **Practical**: ---- **Total:** 3
Program on which the course is given: Diploma in Mechanical Power Engineering
Major or minor element of program: Compulsory
Department offering the program Mechanical Engineering / Power
Department offering the course: Mechanical Engineering / Power
Academic year / level: 2014/2015. **Date of specifications approval: 2012**

Course content	ILO's A	ILO's B	ILO's C	ILO's D
Energy Technology and Energy Sciences	a1			d1
Global Solar Energy Sources- The solar system, solar radiation and solar angles for solar collectors	a2	b1	c1	
Existing Solar Collector Technologies	a2, a3			d2
Flat solar collectors - absorption surface - Solar Collector System Calculation	a1	b1		
Direct and Diffused beam Optical Analysis	a3			d2
Parabolic Trough and Central Receiver system Introduction	a3	b1	c1	
Thermal Analysis and calculation for Parabolic Trough	a2	b1		d3
Solar Thermal Power Plant cycles and calculations	a3		c1	d2
Energy storage systems and PCMs	a1	b1		
Photovoltaic systems and their Application in Power Generation	a2	b1		d2,d4

Matrix of course aims and ILO's

Course Title: **Solar Energy** **Code**: **MEP 511**

Lecture: 3 . **Tutorial**: ---- **Practical**: ---- **Total:** 3

Program on which the course is given: Diploma in Mechanical Power Engineering.

Major or minor element of program: Compulsory

Department offering the program Mechanical Engineering / Power

Department offering the course: Mechanical Engineering / Power

Academic year / level: 2014/2015. **Date of specifications approval: 2012**

Course aims	ILO's A	ILO's B	ILO's C	ILO's D
1. Design, analysis, and operate of the solar power plants components and compound plants.	a2, a3	b1		
2. Engage students in learning about classifications of conventional and non-conventional energy resources.	a1	b1		
3. Get new solutions to efficient solar power-generation problems.		b1		d2,d3
4. Know about the treatment and synthesis of electric-generating power plant technology and engineering.			c1	d2
5. Understand the principle analysis of theoretical, experimental, and design of solar thermal system.	a2, a3			
6. Identify the differences between Recent Developments In Solar Power Plants.		b1		d4
7. Introduce the Sunshapes and Effective Sunshapes and Solar Irradiance Profile.	a2			d2
8. Make a Thermal Analysis of Parabolic Trough		b1		
9. Identify the various kinds of Solar collectors.			c1	d3