**Minoufiya University,**

**Faculty of Engineering,**

**Electrical Eng. Dept.,**

**Post Graduate Studies and Research.**

**Minoufiya University**

Faculty of Engineering

**Course Specification**

***Title: Power Generation from Renewable Sources***

***Code Symbol: ELE 612***

***Department offering the course: Electrical Eng. Dept***

***Date of specification approval: / /2012***

***A- COURSE IDENTIFICATION AND INFORMATION:***

***B - Professional Information***

***B.1 Course Aims:***

This course aims provide the student, upon completing the electrical engineering program,

with the basic knowledge and skills of how to design and operating renewable energy power plant

(REP) types (Wind, Solar photovoltaic and solar cell) to integrated with power systems and

evaluate its impact on energy conservation and environment. This course will also provide students

with the ability to assess the generation of these RESs and economy. The skill of installing and

coordinating of different RESs configurations are also provided. It is also aimed that the student

will get acquainted with the applications of various RES types to accommodate the load energy

requirements considering the meteorological data at the installation site

***B.2 Course Objectives***

**1. Demonstration of the knowledge and understanding of the importance of operating REPs**

**(solar photovoltaic, solar thermal and wind Farms )**

**2. Definition of requirements for installing, operation and generation of REPs.**

**3. Evaluation the energy generation and its economy of the study type of REPs.**

**4. Assessment of the impact operating REPs on conventional energy conservation and**

**environment.**

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| Field | Programme ILOs that the coursecontribute in achieving | Course ILOs |
| Knowledge&Understanding | A1. Understand theory, basics andpractices of mathematics, sciences andvarious electrical power andmachines engineering technologies. | a1-1) Explain theprinciples physics ofelectric powergeneration. |
| A3. Understand the scientificdevelopments in electrical power andmachines engineering. | a3-1) Explain theimportance ofoperating REPs. |
| A5. Understand quality basics forworking in the power and machinesengineering field. | a5-1) Analyzing andunderstanding thequality of energyconsumption inresidential buildings. |
| Intellectual skills | B1. Analyze and evaluate the data anduse it to solve electrical power andmachines problems. | b1-1) Select andevaluate theappropriatemathematical solutionfor REPs problems. |
| B2. Produce solutions to power andmachines problems through theapplication of specific engineeringdiscipline knowledge based on limitedand possible information. | b2-1) Select theappropriate computerprogramming to solveREPs problems basedon possibleinformation. |
| Professional and Practical Skills | C3. Evaluate the available methodsand tools in the power and machinesengineering field. | c3-1) Apply thecomputerprogramming forcharacterizingparameters of WECS. |

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| Field | Academic Reference Standards For Electrical Engineering Postgraduates(ARSEP-ELE) |
| Knowledge &Understanding | IntellectualSkills | Professionaland PracticalSkills | General and TransferrableSkills |
| ProgrammeAcademic Standardsthat the coursecontribute inachieving | A1, A3, A5 | B1,B2 | C3,C4 | D1,D2,D3,D4,D5,D6,D7,D8 |

***B.3 Relationship between the course and the programme***

***B.4 Course Intended Learning Outcomes (ILOs)***

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|  | C4. Define, plan, analyze, and solvethe power and machines problems toreach conclusions and compare theresults with others. | c4-1) Identify andformulate thegeneration energyproblems of windfarms. |
| General and TransferrableSkills | D1. Communicate effectively inwriting, verbally and throughillustrations and mathematicalequations. | d1-1) Effectivecommunication andsharing ideas throughsolving tutorials. |
| D2. Apply information technologytools related to specific power andmachines discipline. | d2-1) Apply thematrix technique allover the course. |
| D3. Evaluate him-her and determinehis personal education needs. | d3-1) Measure his-herlevel by ordinaryinvestigations inregular times. |
| D4. Use different resources to obtainknowledge and information. | .d4-1) Use textbooks,and databasesinformation inlectures. |
| D5. Put the rules and indicators toevaluate performance of the others. | d5-1) Measure actualperformance againstexpected performance. |
| D6. Work with a group and managethe team. | d6-1) communicatewith a team work toanalyze certainproblems. |
| D7. Manage the time efficiently. | d7-1) Apply monthlylist of tasks that needto be done |
| D8. Self and continuous learning. | d8-1) Apply anintroduction tonuclear energy |

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| TopicNo. | General Topics | Weeks |
| 1st | Generation of solar PV power plant | 1 |
| 2nd | Interconnecting solar PV power plants with electric utility and its impact onthe generation cost | 2 |
| 3rd | Integrating solar thermal power plant with conventional thermal power plants | 3-4 |
| 4th | Generation of integrated solar thermal combined cycle | 5-6 |
| 5th | Economy of solar thermal generation | 7 |
| 6th | Interconnecting solar thermal combined cycle with electrical power systemand its impact on the energy generation costs | 8-9 |
| 7th | Generation of wind farms | 10-11 |
| 8th | Interconnecting wind farm with electrical power systems and its impact onenergy generation costs | 12 |
| 9th | Impact of operating REPs on the energy conservation and environment | 13-14 |
| 10th | An introduction to nuclear energy | 15 |

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***B.5 Course Topics.***

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| ***Week******No.*** | ***Sub. Topics*** | ***Total******Hours*** | ***Contact hrs*** | ***Course ILOs******Covered (By No.)*** |
| **Lec.** | **Tut.** | **Lab.** |
| *Week-1* | Generation of solar PV power plant | 6 | 4 | 2 | - | a1-1, a3-1, a5-1, |
| *Week-2* |  Interconnecting solar PV powerplants with electric utility and itsimpact on the generation cost | 6 | 4 | 2 | - | a1-1, a3-1, a5-1,b1-1,b2-1, c3-1,c4-1, |
| *Week-3* | Integrating solar thermal power plantwith conventional thermal power plants | 6 | 4 | 2 | - | a1-1, a3-1, a5-1,b1-1,b2-1, c3-1,c4-1, |
| *Week-4* | Integrating solar thermal power plantwith conventional thermal power plants | 6 | 4 | 2 | - | a1-1, a3-1, a5-1,b1-1,b2-1, c3-1,c4-1 |
| *Week-5* | Integrated solar thermal combined cycle | 6 | 4 | 2 | - | a1-1, a3-1, a5-1,b1-1,b2-1, c3-1,c4-1 |
| *Week-6* | Generation of integrated solar thermalcombined cycle | 6 | 4 | 2 | - | a1-1, a3-1, a5-1,b1-1,b2-1, c3-1,c4-1 |
| *Week-7* | Economy of solar thermal generation | 6 | 4 | 2 | - | a1-1, a3-1, a5-1,b1-1, c3-1, c4-1 |
| *Week-8* | Interconnecting solar thermal combinedcycle with electrical power system | 6 | 4 | 2 | - | a1-1, a3-1, a5-1,b1-1, c3-1, c4-1,d6-1, d3-1, d5-1,d6-1, d7-1, d8-1 |
| *Week-9* | Interconnecting solar thermal combinedcycle with electrical power system andits impact on the energy generationcosts | 6 | 4 | 2 | - | a1-1, a3-1, a5-1,b1-1, c3-1, c4-1,d6-1, d3-1, d5-1,d6-1, d7-1, d8-1 |
| *Week-**10* | Wind farms | 6 | 4 | 2 | - | a1-1, a3-1, a5-1,b1-1, c3-1, c4-1,d6-1, d3-1, d5-1,d6-1, d7-1, d8-1 |
| *Week-**11* | Generation of wind farms | 6 | 4 | 2 | - | b1-1, c3-1, d1-1,d2-1, d3-1, d4-1,d5-1, d6-1, d7-1,d8-1 |
| *Week-**12* | Interconnecting      wind      farm      withelectrical power systems and its impacton energy generation costs | 6 | 4 | 2 | - | a1-1, a3-1, a5-1,b1-1, c3-1, d1-1,d2-1, d3-1, d4-1,d5-1, d6-1, d7-1,d8-1 |
| *Week-**13* | Impact of operating REPs on the energyconservation |  |  |  |  | a1-1, a3-1, a5-1,b1-1, c3-1, d1-1,d2-1, d3-1, d4-1,d5-1, d6-1, d7-1,d8-1 |
| *Week-**14* | Impact      of      operating      REPs      onenvironment |  |  |  |  | b1-1, c3-1, d1-1,d2-1, d3-1, d4-1,d5-1, d6-1, d7-1,d8-1 |
| *Week-**15* | An introduction to nuclear energy |  |  |  |  | d1-1,d2-1, d3-1,d4-1, d5-1, d6-1,d7-1, d8-1 |



***B.6 Course Topics/hours/ILOS***

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| **Course Intended****learning outcomes****(ILOs)** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Knowledge &****understanding** | **a1-1** | **x** |  | **x** | **x** | **x** | **x** |  |  |  |  |  |  |  |
| **a3-1** | **x** |  | **x** | **x** | **x** | **x** |  |  |  |  |  |  |  |
| **a5-1** | **x** |  | **x** | **x** | **x** | **x** |  |  |  |  |  |  |  |
| **Intellectual****Skills** | **b1-1** | **x** |  | **x** | **x** | **x** | **x** | **x** |  |  |  |  |  |  |
| **b2-1** | **x** |  | **x** | **x** | **x** | **x** | **x** |  |  |  |  |  |  |
| **Professional****and practical****Skills** | **c3-1** | **x** |  | **x** | **x** | **x** | **x** | **x** |  |  |  |  |  |  |
| **c4-1** | **x** |  | **x** | **x** | **x** | **x** | **x** |  |  |  |  |  |  |
| **General and****Transferrable****Skills** | **d1-1** | **x** | **x** | **x** | **x** | **x** | **x** | **x** |  | **x** | **x** |  |  |  |
| **d2-1** | **x** | **x** | **x** | **x** | **x** | **x** | **x** |  | **x** | **x** |  |  |  |
| **d3-1** | **x** | **x** | **x** | **x** | **x** | **x** | **x** |  | **x** | **x** |  |  |  |
| **d4-1** | **x** | **x** | **x** | **x** | **x** | **x** | **x** |  | **x** | **x** |  |  |  |
| **d5-1** | **x** | **x** | **x** | **x** | **x** | **x** | **x** |  | **x** | **x** |  |  |  |
| **d6-1** | **x** | **x** | **x** | **x** | **x** | **x** | **x** |  | **x** | **x** |  |  |  |
| **d7-1** | **x** | **x** | **x** | **x** | **x** | **x** | **x** |  | **x** | **x** |  |  |  |
| **d8-1** | **x** | **x** | **x** | **x** | **x** | **x** | **x** |  | **x** | **x** | **x** |  |  |

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| **Assessment Method** | **Mark** | **Percentage** |
| **Final Examination (*written*)** | **100** | **100%** |
| **Total** | **100** | **100%** |



**B.7*Teaching and Learning Method:***

**Selflearning**

**Presentation**

**andMovies**

**Cooperative**

**Discovering**

**Discussion**

**Modelling**

**Sitevisits**

**Problem**

**solving**

**Brain**

**storming**

**Tutorial**

**Projects**

**Lecture**

**Playing**

**B. 8*Assessments:***

***B.9 Facilities required for teaching and learning:***

***Weighting of assessments:***

**A. Library Usage:** Students should be encouraged to use library technical resources in the

preparation of reports.

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***B.10 List of references:***

**1- Michael Geyer and Volker ;"Solar Thermal Power" Renewable energy world ,**

**July-Aug 200**

**2- D.R Mills and C.Dey ;"Development strategies for Solar Thermal Electricity**

**Generation" Solar Energy , Vol.14,2001.**

**3- 3-British Wind Energy Association ;"Wind Energy Technology"**

**(http:\www.bwea.com\ref\tecohehtml).**

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**Course Coordinators:** **Head of Department**

**Prof. Dr. Abdel-Mohsen Kinawy** **Prof. Dr. Gamal Morsi**

**Prof. Atef Abd El-Hakim El-Zeftawy**

**Dr. Hala S. El-Sayed**

**Date:**