**Minoufiya University,**

**Faculty of Engineering,**

**Electrical Eng. Dept.,**

**Post Graduate Studies and Research.**

**Minoufiya University**

Faculty of Engineering

**Course Specification**

***Title: Protection of Electrical Power Systems***

***Code Symbol: ELE 512***

***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 to the following:- Integrate practical knowledge on the power system protection.

Gain research talent in power system protection. Practicality of the fault location techniques.

Communication applications for power system protection. Practical protection applied on

renewable energy resources (wind farm and photovoltaic system).

***B.2 Course Objectives***

**The objective of this course is to provide the students with the following items:**

**1. Identify the recent research progress in the protection systems.**

**2. Recognize the improvement in the protection functions.**

**3. Study the protection of new systems such as wind farm and photovoltaic.**

**4. The above items will practically improve the student attitude.**

**5. Enhance the presentation skills by making and doing presentations related to one of the**

**course topics.**

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| Field | Programme ILOs that the coursecontribute in achieving | Course ILOs |
| Knowledge&Understanding | A1) Integrate theories, fundamentalsand knowledge of electrical power inpractice. | a1.1) Recognize the research interestand      progress      concerning      theprotection applications.a1.2)     Recognize     the     protectionprinciples of the renewable energyresource systems. |
| Intellectualskills | B3) Read and analyze researches andtopics related to the electrical powerspecialization. | b3.1) Read research articles and textchapters    in    order    to    prepare    acorresponding presentation.b3.2) Improve the student attitude asa presenter. |
| Professional andpractical skills | C1) Apply the professional engineeringtechnologies in the field of electricalpower specialization. | c1.1) Apply new technologies forenhancing the protection systems.c1.2) Apply protection systems forthe renewable energy system. |
| General andtransferableskills | D2) Use of information technology toserve the development of engineeringprofessional practice. | d2.1)       Improve       the       practicalknowledge    using    researches    andIEEE and IEC standards. |
| D7)      Self-      learning      continuouslyspecially in electrical power branch. | d7.1)    Self-learning    in    protectionapplications by presenting research,standard and practical materials. |

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| Field | Academic Reference Standards For Electrical EngineeringPostgraduates (ARSEP-ELE) |
| Knowledge &Understanding | IntellectualSkills | Professional andPractical Skills | General andTransferrableSkills |
| Programme AcademicStandards that the coursecontribute in achieving | A1 | B3 | C1 | D2 & D7 |

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| TopicNo. | General Topics | Weeks |
| 1st | Protection of transmission and distribution systems. | 1-9 |
| 2nd | Protection of generators and motors. | 10-11 |
| 3rd | Protection principles of renewable energy resources. | 12-13 |
| 4th | Fault location. | 14-15 |

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

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

***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* | Introduction. | 3 | 3 | - | - | a1.1, d2.1 |
| *Week-2* | Unit protection and differential protection:restricted earth fault protection. | 3 | 3 | - | - | c1.1, |
| *Week-3* | Differential protection for transformer:Identifying the inrush and internal faultcurrents. | 3 | 3 | - | - | a1.1, b3.1, b3.2,d2.1, d7.1 |
| *Week-4* | Differential protection for transmissionline:    Current    and    power    differentialprotection. | 3 | 3 | - | - | a1.1, b3.1, b3.2,d2.1, d7.1 |
| *Week-5* | Distance    protections    for    transmissionlines:      single      and      double      circuittransmission system. | 3 | 3 | - | - | a1.1, b3.1, b3.2,d2.1, d7.1 |
| *Week-6* | Enhancing the distance unit protection:Pilot protection system. | 3 | 3 | - | - | a1.1, b3.1, b3.2,d2.1, d7.1 |
| *Week-7* | Cont.    Enhancing    the    distance    unitprotection: non-communication systems. | 3 | 3 | - | - | a1.1, b3.1, b3.2,d2.1, d7.1 |
| *Week-8* | Protection of ring mains and gradedprotection applied to distribution systems. | 3 | 3 | - | - | a1.1, c1.1 |
| *Week-9* | Communication applications to enhancetransmission and distribution protection. | 3 | 3 | - | - | a1.1, c1.1 |
| *Week-10* | Protection of generators. | 3 | 3 | - | - | a1.1, b3.1, b3.2,d2.1, d7.1 |
| *Week-11* | Protection of motors: | 3 | 3 | - | - | a1.1, b3.1, b3.2,d2.1, d7.1 |
| *Week-12* | Protection principles of renewable energyresources: wind farms. | 3 | 3 | - | - | a1.2, c1.2 |
| *Week-13* | Cont. Protection principles of renewableenergy resources: Photovoltaic systems. | 3 | 3 | - | - | a1.2, c1.2 |
| *Week-14* | Fault location-based phasor measurementsand traveling waves. | 3 | 3 | - | - | a1.1, b3.1, b3.2,d2.1, d7.1 |
| *Week-15* | Cont.      Fault      location-based      phasormeasurements and traveling waves. | 3 | 3 | - | - | a1.1, b3.1, b3.2,d2.1, d7.1 |

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| **Course Intended****learning outcomes****(ILOs)** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Knowledge &****understanding** | a1.1 | **x** |  |  |  |  |  |  |  | **x** |  |  |  |  |
| a1.2 |  | **x** | **x** |  |  |  |  |  | **x** |  |  |  |  |
| **Intellectual Skills** | b3.1 |  | **x** | **x** |  |  |  |  |  | **x** |  |  |  |  |
| b3.2 |  | **x** | **x** |  |  |  |  |  | **x** |  |  |  |  |
| **Professional and****Practical Skills** | c1.1 | **x** | **x** |  |  |  |  |  |  |  |  |  |  |  |
| c1.2 | **x** | **x** | **x** |  |  |  |  |  | **x** |  |  |  |  |

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**Selflearning**

**Presentation**

**andmovies**

**Cooperative**

**Discovering**

**Discussion**

**Modelling**

**Sitevisits**

**Problem**

**solving**

**Brain**

**storming**

**Tutorial**

**Projects**

**Lecture**

**Playing**

***B.6  Course Topics/hours/ILOS***

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

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

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| **General and****Transferrable****Skills** | d2.1 | **x** | **x** | **x** |  |  |  |  |  | **x** |  |  |  |  |
| d7.1 |  | **x** | **x** |  |  |  |  |  | **x** |  |  |  |  |



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

**B. 8*Assessments:***

***Weighting of assessments:***

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

preparation of reports. So, the computers with sufficient electronic resources should be

available.

**B. Classrooms:** The lecturer and students are going to prepare presentations including research

knowledge and therefore computer and data show (LED) is required.

***B.10 List of references:***

1- IEEE transactions using (www.ieeexplore.ieee.org).

2- Electric power system research (http://www.journals.elsevier.com/electric-power-

systems-research/).

3- International conferences.

4- Practical manuals and standards.

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

**Prof. Dr. Abdel-Maksoud I. Taalab** **Prof. Dr. Gamal Morsi**

**Dr. Nagy I. Elkalashy**

**Date:**