**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 course  contribute in achieving | Course ILOs |
| Knowledge&  Understanding | A1) Integrate theories, fundamentals  and knowledge of electrical power in  practice. | a1.1) Recognize the research interest  and      progress      concerning      the  protection applications.  a1.2)     Recognize     the     protection  principles of the renewable energy  resource systems. |
| Intellectual  skills | B3) Read and analyze researches and  topics related to the electrical power  specialization. | b3.1) Read research articles and text  chapters    in    order    to    prepare    a  corresponding presentation.  b3.2) Improve the student attitude as  a presenter. |
| Professional and  practical skills | C1) Apply the professional engineering  technologies in the field of electrical  power specialization. | c1.1) Apply new technologies for  enhancing the protection systems.  c1.2) Apply protection systems for  the renewable energy system. |
| General and  transferable  skills | D2) Use of information technology to  serve the development of engineering  professional practice. | d2.1)       Improve       the       practical  knowledge    using    researches    and  IEEE and IEC standards. |
| D7)      Self-      learning      continuously  specially in electrical power branch. | d7.1)    Self-learning    in    protection  applications by presenting research,  standard and practical materials. |

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| Field | Academic Reference Standards For Electrical Engineering  Postgraduates (ARSEP-ELE) | | | |
| Knowledge &  Understanding | Intellectual  Skills | Professional and  Practical Skills | General and  Transferrable  Skills |
| Programme Academic  Standards that the course  contribute in achieving | A1 | B3 | C1 | D2 & D7 |

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| Topic  No. | 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 fault  currents. | 3 | 3 | - | - | a1.1, b3.1, b3.2,  d2.1, d7.1 |
| *Week-4* | Differential protection for transmission  line:    Current    and    power    differential  protection. | 3 | 3 | - | - | a1.1, b3.1, b3.2,  d2.1, d7.1 |
| *Week-5* | Distance    protections    for    transmission  lines:      single      and      double      circuit  transmission 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    unit  protection: non-communication systems. | 3 | 3 | - | - | a1.1, b3.1, b3.2,  d2.1, d7.1 |
| *Week-8* | Protection of ring mains and graded  protection applied to distribution systems. | 3 | 3 | - | - | a1.1, c1.1 |
| *Week-9* | Communication applications to enhance  transmission 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 energy  resources: wind farms. | 3 | 3 | - | - | a1.2, c1.2 |
| *Week-13* | Cont. Protection principles of renewable  energy resources: Photovoltaic systems. | 3 | 3 | - | - | a1.2, c1.2 |
| *Week-14* | Fault location-based phasor measurements  and traveling waves. | 3 | 3 | - | - | a1.1, b3.1, b3.2,  d2.1, d7.1 |
| *Week-15* | Cont.      Fault      location-based      phasor  measurements 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:**