**Minoufiya University,**

**Faculty of Engineering,**

**Electrical Eng. Dept.,**

**Post Graduate Studies and Research.**

**Minoufiya University**

Faculty of Engineering

**Course Specification**

***Title: Electric Power System Analysis***

***Code Symbol: ELE 605***

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

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

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

***B - Professional Information***

***B.1 Course Aims:***

The aims of this course are to provide the student, with the basic knowledge and skills of electrical

power system analysis. Also, the skill of how to operate the power system in an optimal state is

also provided.This course will also provide students with the ability to select and design the series

and shunt harmonics filters. The skill of dealing with the stability problems (voltage stability,

transient stability of multi-machine electrical power systems, stability of indcution motors), power

quality problems and voltage collapse problems is also provided. It is also aimed that the student

will get acquainted with the unit commitment, load scheduling, optimal load flow problems.

***B.2 Course Objectives***

1. Study and understand the optimal operation of the electrical power system.

2. Study and understand the steady-state pull-out curve.

3. Study and understand the transient stability of multi-machine electrical power systems.

4. Study and understand the voltage stability of the electrical power systems.

5. Study and understand the power quality of the electrical power systems.

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| Field | Programme ILOs that the course  contribute in achieving | Course ILOs |
| Knowledge&  Understanding | A1. Understand theory, basics and  practices of mathematics, sciences and  various          electrical          engineering  technologies. | a1.1) Recognize the optimal operation  of the electrical power system.  a1.2) Recognize the transient stability  of    multi-machine    electrical    power  systems.  a1.3) Recognize the voltage stability of  the electrical power systems.  a1.4) Recognize the power quality of  the electrical power systems. |
| Intellectual  skills | B1. Analyze and evaluate the data and  use    them    to    solve    the    electrical  engineering problems. | b1.1) Analyze and evaluate the data and  use    them    to    solve    the    electrical  engineering problems. |
| B2. Produce solutions to problems  through the application of specific  electrical        engineering       discipline  knowledge    based    on    limited    and  possible information. | b2.1) Produce solutions to problems  through the application of numerical  methods    for    the    generators    swing  equations. |
| B3.      Deal      with      different      and  contradicting knowledge to solve the  problems. | b3.1)     Deal     with     different     and  contradicting knowledge to solve the  unit    commitment,    load    scheduling,  optimal load flow problems.  b3.2)     Deal     with     different     and  contradicting knowledge to solve the  stability problems. |
| B5. Evaluate the risks in the design of  specific electrical engineering system. | b5.1) Evaluate the risks in the design of  series and shunt harmonics filters. |
| B7. Take the suitable decision for  different professional situations. | b7.1) Take the suitable decision for  voltage stability and voltage collapse  problems.  b7.2) Take the suitable decision for  stability of indcution motors problems.  b7.3) Take the suitable decision for  transient phenomena problems. |

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| Field | Academic Reference Standards For Electrical Engineering  Postgraduates (ARSEP-ELE) | | | |
| Knowledge &  Understanding | Intellectual  Skills | Professional  and  practical  Skills | General and  transferable  Skills |
| Programme Academic  Standards that the course  contribute in achieving | A1 | B1, B2, B3,  B5, B7, | C3, C4 | D2, D4, D6, D8 |

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

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

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| Professional  and practical  skills | C3. Evaluate the available methods and  tools in electrical engineering field. | c3.1) Evaluate the available methods  and tools in electrical power systems  field. |
| C4. Define, plan, analyze, and solve the  engineering      problems      to      reach  conclusions and compare the results  with others. | c4.1) Define and solve the optimal  operation problems of the electrical  power systems.  c4.2) Define and solve the stability  problems    of    the    electrical    power  systems.  c4.3) Define and solve the power  quality problems of the electrical power  systems. |
| D2.    Apply    information    technology  tools    related    to    specific    electrical  engineering discipline. | d2-1) Use electronic communication  and      computer-based      systems      of  hardware and software and associated  processes through emphasis on the  information basis for engineering. |
| D4. Use different resources to obtain  knowledge and information. | d4-1) Searching for handbooks using  the library.  d4-2) Use of the internet. |
| D6. Work with a group and manage the  team. | d6.1) The student well prepared for  project member. |
| D8. Learn him/her-self continuously. | d8.1) Self-learning in power systems  branches     by     presenting     research,  standard and practical materials. |

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| ***Week***  ***No.*** | ***Sub. Topics*** | ***Total***  ***Hours*** | ***Contact hrs*** | | | ***Course ILOs***  ***Covered (By***  ***No.)*** |
| **Lec.** | **Tut.** | **Lab.** |
| *Week-*  *1* | Generator     operating     cost     −     unit  commitment-load          scheduling          −  illustrative examples. | 3 | 3 | - | - | a1.1, b3.1,  c4.1 |
| *Week-*  *2* | Dynamic         programming         method-  reliability considerations − illustrative  examples. | 3 | 3 | - | - | a1.1, c3.1 |
| *Week-*  *3* | Security     constrained     optimal     unit-  commitment −  ad flow −  illustrative examples. | 3 | 3 | - | - | a1.1, b3.1,  c4.1 |

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| Topic  No. | General Topics | Weeks |
| 1st | Optimal system operation | 1-3 |
| 2nd | Steady-state pull-out curve | 4 |
| 3rd | Transient stability of multi-machine power systems | 5-6 |
| 4th | Voltage stability of power systems | 7-11 |
| 5th | Power quality of power systems | 12-15 |

***B.5 Course Topics.***

***B.6 Course Topics/hours/ILOS***

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| *Week-*  *4* | Derivation     of     the     generator     P-Q  characteristics −   | 3 | 3 | - | - | b1.1 |
| *Week-*  *5* | Swing operation of multi-machine  generators − numerical methods of the  generators swing equations. | 3 | 3 | - | - | a1.2, b1.1,  b2.1, c3.1 |
| *Week-*  *6* | Stability studies −   | 3 | 3 | - | - | a1.3, b3.2,  b7.1, b7.2,  c4.2 |
| *Week-*  *7* | Voltage stability and voltage collapse −  P-V characteristics −maximum  transmitted power. | 3 | 3 | - | - | a1.3, b3.2,  b7.1, c4.2 |
| *Week-*  *8* | Illustrative examples −-V  characteristics −   | 3 | 3 | - | - | a1.3 |
| *Week-*  *9* | Constant power and constant impedance  loads −   | 3 | 3 | - | - | b1.1 |
| *Week-*  *10* | Characteristics of indcution motor loads-  stability of indcution motors − illustrative  examples | 3 | 3 | - | - | b3.2, b7.2,  c4.2 |
| *Week-*  *11* | Transient phenomena in power supply  system − illustrative examples | 3 | 3 | - | - | b7.3 |
| *Week-*  *12* | What is the power system power quality  − harmonics of typical loads and sources. | 3 | 3 | - | - | a1.4, c4.3 |
| *Week-*  *13* | Harmonics effects and consequances −  harmonics limits standards. | 3 | 3 | - | - | b1.1 |
| *Week-*  *14* | Series and shunt harmonics filters −  damped filters. | 3 | 3 | - | - | b5.1, c3.1 |
| *Week-*  *15* | Princible consideration of filters design −  illustrative examples | 3 | 3 | - | - | b5.1 |

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| **Course Intended**  **learning outcomes**  **(ILOs)** | |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Knowledge &**  **understanding** | a1.1 | **x** |  |  |  |  |  |  |  |  |  |  |  |  |
| a1.2 | **x** |  |  |  |  |  |  |  |  |  |  |  |  |
| a1.3 | **x** |  |  |  |  |  |  |  |  |  |  |  |  |
| a1.4 | **x** |  |  |  |  |  |  |  |  |  |  |  |  |
| **Intellectual**  **Skills** | b1.1 | **x** |  |  |  | **x** | **x** |  |  |  |  |  |  |  |
| b2.1 | **x** |  |  | **x** | **x** |  |  |  |  |  |  |  |  |
| b3.1 | **x** |  |  | **x** | **x** |  |  |  |  |  |  |  |  |
| b3.2 | **x** |  |  | **x** | **x** |  |  |  |  |  |  |  |  |
| b5.1 | **x** |  |  | **x** | **x** |  |  |  |  |  |  |  |  |
| b7.1 | **x** |  |  | **x** | **x** |  |  |  | **x** |  |  |  |  |
| b7.2 | **x** |  |  | **x** | **x** |  |  |  | **x** |  |  |  |  |
| b7.3 | **x** |  |  | **x** | **x** |  |  |  | **x** |  |  |  |  |
| **Professional**  **and Practical** | c3.1 | **x** |  |  | **x** | **x** |  |  |  |  |  |  |  |  |
| c4.1 | **x** |  |  | **x** | **x** |  |  |  |  |  |  |  |  |



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

**Selflearning**

**Presentation**

**andMovies**

**Cooperative**

**Discovering**

**Discussion**

**Modelling**

**Sitevisits**

**Problem**

**solving**

**Brain**

**storming**

**Tutorial**

**Projects**

**Lecture**

**Playing**

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| **Skills** | c4.2 | **x** |  |  | **x** | **x** |  |  |  |  |  |  |  |  |
| c4.3 | **x** |  |  | **x** | **x** |  |  |  |  |  |  |  |  |
| **General and**  **Transferable**  **Skills** | d2-1 |  |  |  |  |  |  | **x** |  |  |  |  |  |  |
| d4-1 |  | **x** |  |  |  |  | **x** |  |  |  |  |  |  |
| d4-2 |  |  |  | **x** |  |  | **x** |  |  |  |  |  |  |
| d6.1 |  |  |  |  |  |  | **x** |  |  |  |  |  |  |
| d8.1 |  | **x** |  |  |  |  | **x** |  |  |  |  |  |  |

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

***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.

**B. The Internet:** Student should be encouraged to use the internet in the preparation of the

professional reports.

***B.10 List of references:***

1- Power System Control and Stability. p.m.Anderson& B.D. Fouad, 1982.

2- Transient Stability of Power System. M. Pavella& P.G. Murthy, 1994.

3- Power System Stability and Control. P. Kundur, 1993.

4- Power System Voltage Stability. C.W. taylor.

5- Power System Voltage Stability and Power Quality. M.Z. El-Sader, 2001.

6- Electrical Power System Quality. R.C. Dugen, 2006.

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

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**Dr. Shaimaa R. Spea**

**Date:**