**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.

1/ELE 605

|  |  |  |
| --- | --- | --- |
| Field | Programme ILOs that the coursecontribute in achieving | Course ILOs |
| Knowledge&Understanding | A1. Understand theory, basics andpractices of mathematics, sciences andvarious          electrical          engineeringtechnologies. | a1.1) Recognize the optimal operationof the electrical power system.a1.2) Recognize the transient stabilityof    multi-machine    electrical    powersystems.a1.3) Recognize the voltage stability ofthe electrical power systems.a1.4) Recognize the power quality ofthe electrical power systems. |
| Intellectualskills | B1. Analyze and evaluate the data anduse    them    to    solve    the    electricalengineering problems. | b1.1) Analyze and evaluate the data anduse    them    to    solve    the    electricalengineering problems. |
| B2. Produce solutions to problemsthrough the application of specificelectrical        engineering       disciplineknowledge    based    on    limited    andpossible information. | b2.1) Produce solutions to problemsthrough the application of numericalmethods    for    the    generators    swingequations. |
| B3.      Deal      with      different      andcontradicting knowledge to solve theproblems. | b3.1)     Deal     with     different     andcontradicting knowledge to solve theunit    commitment,    load    scheduling,optimal load flow problems.b3.2)     Deal     with     different     andcontradicting knowledge to solve thestability problems. |
| B5. Evaluate the risks in the design ofspecific electrical engineering system. | b5.1) Evaluate the risks in the design ofseries and shunt harmonics filters. |
| B7. Take the suitable decision fordifferent professional situations. | b7.1) Take the suitable decision forvoltage stability and voltage collapseproblems.b7.2) Take the suitable decision forstability of indcution motors problems.b7.3) Take the suitable decision fortransient phenomena problems. |

|  |  |
| --- | --- |
| Field | Academic Reference Standards For Electrical EngineeringPostgraduates (ARSEP-ELE) |
| Knowledge &Understanding | IntellectualSkills | ProfessionalandpracticalSkills | General andtransferableSkills |
| Programme AcademicStandards that the coursecontribute 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)***

2/ELE 605

|  |  |  |
| --- | --- | --- |
| Professionaland practicalskills | C3. Evaluate the available methods andtools in electrical engineering field. | c3.1) Evaluate the available methodsand tools in electrical power systemsfield. |
| C4. Define, plan, analyze, and solve theengineering      problems      to      reachconclusions and compare the resultswith others. | c4.1) Define and solve the optimaloperation problems of the electricalpower systems.c4.2) Define and solve the stabilityproblems    of    the    electrical    powersystems.c4.3) Define and solve the powerquality problems of the electrical powersystems. |
| D2.    Apply    information    technologytools    related    to    specific    electricalengineering discipline. | d2-1) Use electronic communicationand      computer-based      systems      ofhardware and software and associatedprocesses through emphasis on theinformation basis for engineering. |
| D4. Use different resources to obtainknowledge and information. | d4-1) Searching for handbooks usingthe library.d4-2) Use of the internet. |
| D6. Work with a group and manage theteam. | d6.1) The student well prepared forproject member. |
| D8. Learn him/her-self continuously. | d8.1) Self-learning in power systemsbranches     by     presenting     research,standard and practical materials. |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Week******No.*** | ***Sub. Topics*** | ***Total******Hours*** | ***Contact hrs*** | ***Course ILOs******Covered (By******No.)*** |
| **Lec.** | **Tut.** | **Lab.** |
| *Week-**1* | Generator     operating     cost     −     unitcommitment-load          scheduling          −illustrative examples. | 3 | 3 | - | - | a1.1, b3.1,c4.1 |
| *Week-**2* | Dynamic         programming         method-reliability considerations − illustrativeexamples. | 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 |

|  |  |  |
| --- | --- | --- |
| TopicNo. | 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***

3/ELE 605

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *Week-**4* | Derivation     of     the     generator     P-Qcharacteristics −   | 3 | 3 | - | - | b1.1 |
| *Week-**5* | Swing operation of multi-machinegenerators − numerical methods of thegenerators 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 −maximumtransmitted power. | 3 | 3 | - | - | a1.3, b3.2,b7.1, c4.2 |
| *Week-**8* | Illustrative examples −-Vcharacteristics −   | 3 | 3 | - | - | a1.3 |
| *Week-**9* | Constant power and constant impedanceloads −   | 3 | 3 | - | - | b1.1 |
| *Week-**10* | Characteristics of indcution motor loads-stability of indcution motors − illustrativeexamples | 3 | 3 | - | - | b3.2, b7.2,c4.2 |
| *Week-**11* | Transient phenomena in power supplysystem − 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 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **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** |  |  |  |  |  |  |  |  |



4/ELE 605

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

**Selflearning**

**Presentation**

**andMovies**

**Cooperative**

**Discovering**

**Discussion**

**Modelling**

**Sitevisits**

**Problem**

**solving**

**Brain**

**storming**

**Tutorial**

**Projects**

**Lecture**

**Playing**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **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** |  |  |  |  |  |  |

|  |  |  |
| --- | --- | --- |
| **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.

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

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

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

**Dr. Shaimaa R. Spea**

**Date:**