|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Programme AcademicStandards that the coursecontribute in achieving | A1, A2 & A3 | B1 & B7 | C1 & C4 | D4, D6 & D8 |

**Minoufiya University,**

**Faculty of Engineering,**

**Electrical Eng. Dept.,**

**Post Graduate Studies and Research.**

**Minoufiya University**

Faculty of Engineering

**Course Specification**



***Title: Overvoltage and Insulation Co-ordination***

***Code Symbol: ELE 619***

***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 skills of how to control the

overvoltages in power system. This course will also provide students with the ability to apply the

appropriate insulation coordination on real network. The skill of selecting the location of surge

arresters is also provided.

***B.2 Course Objectives***

1. Realizing of overvoltages causes and their controlling methods.

2. Analyzing the performance of the network under overvoltage conditions.

3. Demonstration of the insulation co-ordination methods.

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

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| --- | --- | --- |
| Field | Programme ILOs that thecourse contribute in achieving | Course ILOs |
| Knowledge &Understanding | A1.      Theory,      basics      andpractices       of       mathematics,sciences and various    electricalpower           and           machinesengineering technologies. | a1.1) Identify the causes of overvoltages.a1.2) Recognize the factors affectingswitching and lightning overvoltages.a1.3)    Define    the    terms:    insulationcoordination, back flashover, direct andindirect strikes, risk of failure. |
| A2. The exchange effect amongthe engineering practices andreflection on the environment. | a2.1) Explain the controlling methods ofswitching and lightning surges.a2.2) Describe the methods to attenuatethe lightning overvoltage. |
| A3.             The             scientificdevelopments      in      electricalpower           and           machinesengineering. | a3.1) Recognize the principles and rulesof insulation coordination.a3.2) Compare between conventional andstatistical      approach      methods      forinsulation coordination.a3.3) Compare between compact andconventional network. |
| Intellectual skills | B1. Analyze and evaluate thedata    and    use    it    to    solveelectrical power and machinesproblems. | b1.1) Compute switching and lightningovervoltages.b1.2)    Carry out    the    insulation    co-ordination procedure. |
| B7. Take the suitable decisionfor       different       professionalsituations. | b7.1) Determine the location of surgearresters. |
| Professional andPractical Skills | C1. Use efficiently the availabletools as computer programs andmeasuring instruments as wellas     building     ideas     in     thelaboratory          or          throughsimulation          and           applyengineering techniques. | c1.1) Perform insulation co-ordination ona network.c1.2) Apply the overvoltage controllingmethods on a network. |
| C4. Define, plan, analyze, andsolve the power and machinesproblems to reach conclusionsand compare the results withothers. | c4.1) Analyz the performance of thenetwork subjected to overvoltages usingATP/EMTP. |
| General andTransferable Skills | D4. Use different resources toobtain         knowledge          andinformation. | d4.1) Use specialized books and relatedinternet websites to prepare reports andpresentations. |



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

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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 & a1.3 |
| *Week-2* | System overvoltages: Externalovervoltages, Internal overvoltages | 3 | 3 | - | - | a1.1 |
| *Week-3* | Switching overvoltages: Factors affectingswitching overvoltage (Sourceconfiguration, Remnant charge,Transmission line length) | 3 | 3 | - | - | a1.2 |
| *Week-4* | Switching overvoltages cont.: Factorsaffecting switching overvoltage(Compensation, Circuit-breaker polescatter, Point-on-wave of circuit-breakerclosure). | 3 | 3 | - | - | a1.2 |
| *Week-5* | Switching overvoltages cont.: computedswitching overvoltages, Methods ofcontrolling switching surges (Circuit-breaker pre-insertion resistors). | 3 | 3 | - | - | b1.1, d4.1, d6.1 &d8.1 |
| *Week-6* | Switching overvoltages cont.: Methods ofcontrolling switching surges (Circuit-breaker point-on-wave control). | 3 | 3 | - | - | a2.1, c1.2, d4.1,d6.1 & d8.1 |
| *Week-7* | Switching overvoltages cont.: Methods ofcontrolling switching surges (Comparisonof switching over-voltage control methods) | 3 | 3 | - | - | a2.1, c1.2, d4.1,d6.1 & d8.1 |
| *Week-8* | lightning overvoltages: Factors affectinglightning overvoltage entering substations(Back flash-over, Direct strike) | 3 | 3 | - | - | a1.2 & a1.3 |
| *Week-9* | Lightning overvoltages cont.: Attenuationof lightning overvoltage. computedlightning overvoltages. | 3 | 3 | - | - | a2.2, b1.1 & d6.1 |
| *Week-**10* | Lightning overvoltages cont.: Methods ofcontrolling lightning over-voltage (Locationof surge arresters) | 3 | 3 | - | - | a2.1, b7.1, c1.2,d4.1, d6.1 & d8.1 |
| *Week-**11* | Insulation coordination: conventionalmethod of insulation co-ordination | 3 | 3 | - | - | a1.3, a3.1, a3.2,b1.2, c1.1& d6.1 |

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| TopicNo. | General Topics | Weeks |
| 1st | System Switching and lightning overvoltages | 2-10 |
| 2rd | Insulation coordination | 11-12 |
| 3th | Compact transmission lines | 13 |
| 4th | Network simulation and analysis | 14-15 |

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|  | D6. Work with a group andmanage the team. | d6.1) Cooperate with the colleagues topresent collaborative work. |
| D8.     Self     and     continuouslearning. | d8.1)      Provide      the      student      withresearching attitude. |



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***B.5  Course Topics.***

***B.6  Course Topics/hours/ILOS***

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| **Course Intended****learning outcomes****(ILOs)** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Knowledge &****understanding** | **a1.1** | **x** |  | **x** |  |  |  |  |  |  |  |  |  |  |
| **a1.2** | **x** |  | **x** |  |  |  |  |  |  |  |  |  |  |
| **a1.3** | **x** |  | **x** |  |  |  |  |  |  |  |  |  |  |
| **a2.1** | **x** |  | **x** |  |  |  |  |  | **x** | **x** |  |  |  |
| **a2.2** | **x** |  | **x** |  |  |  |  |  | **x** | **x** |  |  |  |
| **a3.1** | **x** |  | **x** |  |  |  |  |  | **x** | **x** |  |  |  |
| **a3.2** | **x** |  | **x** |  |  |  |  |  | **x** | **x** |  |  |  |
| **a3.3** | **x** |  | **x** |  |  |  |  |  | **x** | **x** |  |  |  |
| **Intellectual****Skills** | **b1.1** | **x** |  | **x** |  | **x** |  |  |  | **x** |  |  |  |  |
| **b1.2** |  | **x** | **x** |  |  |  | **x** |  |  |  |  |  |  |
| **b7.1** | **x** |  | **x** |  |  |  |  |  | **x** | **x** |  | **x** |  |
| **Professional****and practical****Skills** | **c1.1** |  | **x** | **x** |  |  |  | **x** |  | **x** | **x** |  | **x** |  |
| **c1.2** |  | **x** | **x** |  |  |  | **x** |  | **x** | **x** |  | **x** |  |
| **c4.1** | **x** |  | **x** |  |  |  | **x** |  | **x** | **x** |  | **x** |  |
| **General and****transferable****Skills** | **d4.1** |  |  | **x** |  |  |  | **x** |  | **x** | **x** |  | **x** |  |
| **d6.1** |  |  |  |  |  |  | **x** |  | **x** | **x** |  |  |  |
| **d8.1** |  |  | **x** |  |  |  | **x** |  | **x** | **x** |  | **x** |  |

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| *Week-**12* | Insulation coordination cont.: StatisticalApproach to insulation co-ordination, Riskof failure | 3 | 3 | - | - | a1.3, a3.1, a3.2,b1.2, c1.1, d4.1 &d8.1 |
| *Week-**13* | Compact transmission lines: insulation,surge arresters, comparison betweencompact and conventional network. | 3 | 3 | - | - | a3.3, d4.1, d6.1 &d8.1 |
| *Week-**14* | Network simulation and analysis:transmission lines, cables, circuit breakers,transformers, network reduction. | 3 | 3 | - | - | c1.2, c4.1, d4.1,d6.1 & d8.1 |
| *Week-**15* | Network simulation and analysis cont.:transmission lines, cables, circuit breakers,transformers, network reduction. | 3 | 3 | - | - | c1.2, c4.1, d4.1,d6.1 & d8.1 |

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



**B. 8*Assessments:***

**Selflearning**

**Presentation**

**andMovies**

**Cooperative**

**Discovering**

**Discussion**

**Modelling**

**Sitevisits**

**Problem**

**solving**

**Brain**

**storming**

**Tutorial**

**Projects**

**Lecture**

**Playing**

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

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***Weighting of assessments:***

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

1.**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.

2.**Class room** facilitated by computer, white board and datashow.

3.**ATP/EMTP** and**MATLAB** packages**.**

***B.10 List of references:***

1. H. M. Ryan “High Voltage Engineering and Testing”, Institution of Electrical Engineers, 2001.

2. A. Haddad, D. F. Warne, “Advances in high voltage engineering”, the institution of electrical

engineer, London, United Kingdom 2004.

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Heinemann , 2000.

5. IEEE Std., IEEE Standard for Insulation Co-ordination Definitions, Principles and Rules, 2010.

6. K. H. Weck, “Principles and procedures of insulation co-ordination”, IEE Proceedings, Vol.

134, Pt. C, No. 2, MARCH 1987.

7. S. Mitra, D. Durga Praveen Kumar, Archana Sharma, K. V. Nagesh and D.P. Chakravarty,

“Study of Insulation Coordination in the Presence of Multiple Dielectric Materials” APAC

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8. A. Sekso-Telento, S. bojic, j. Trbus, “Some Questions of Insulation Coordination in Distributive

Networks in Regions with Hills and Mountaines in Croatia”, 18th International Conference on

Electricity Distribution, Turin, 6-9 June 2005.

9. Recent published journal and international conference papers.

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

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

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**Dr. Nehmdoh A. Sabiha**

**Date:**