**Minoufiya University,**

**Faculty of Engineering,**

**Electrical Eng. Dept.,**

**Post Graduate Studies and Research.**

**Course Specification**

**Minoufiya University**

Faculty of Engineering

***Title: High Voltage Engineering***

***Code Symbol: ELE 514***

***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 test the electrical

insulations using different techniques. This course will also provide students with the ability to

select the appropriate insulating materials for certain equipment. The skill of applying electric

stress control is also provided as well as evaluating the status of the high voltage equipment from

high voltage point of view. It is also aimed that the student will get principles of designing the high

voltage laboratories.

***B.2 Course Objectives:***

1. Learning different test techniques under various conditions.

2. Learning electric field calculation and measurements.

3. Interpreting corona phenomenon.

4. Applying electric stress control.

5. Evaluating the performance of high voltage equipment under various conditions.

7. Learning the requirements and precautions for designing high voltage laboratory**.**

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| Field | Programme ILOs that thecourse contribute in achieving | Course ILOs |
| Knowledge&Understanding | A1.Integrate                theories,fundamentals and knowledgeof electrical power in practice. | a1.1) Recognize various test techniquesof electrical insulation.a1.2) Recognize the different types ofelectric fields.a1.3) Identify different methods forelectric stress control.a1.4)       Recognize        the       differentperformance of high voltage equipmentunder various conditions.a1.5) Identify the types of insulatingmaterials       in       various       electricalequipments.a1.6) Describe the common test facilitiesavailable in high voltage laboratories. |
| A3. Know requirements forsafe           operation           andconservation          of          theenvironment. | a3.1) Recognize the extra precautionsthat are to be taken while grounding animpulse current generator in the highvoltage laboratory. |
| Intellectual skills | B2.         Solve         electricalengineering problems in thearea     of     electrical    powerspecialization. | b2.1)        Estimate        electric        fieldsdistribution.b2.2) Measure and calculating electricfields.b2.3) Calculate corona current pulsesand frequency. |
| B4.    Assess    the    risks    inprofessional           engineeringpractices. | b4.1) Evaluate the performance of highvoltage     equipment     under     variousconditions. |
| B5. Make career decisions inthe      light      of      availableengineering information. | b5.1) Select a typical grounding systemused in a high voltage laboratory.b5.2) Estimate the clearances requiredand the approximate dimensions of thetest room for a high voltage laboratory. |

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| Field | Academic Reference Standards For Electrical EngineeringPostgraduates (ARSEP-ELE) |
| Knowledge &Understanding | IntellectualSkills | Professionaland PracticalSkills | General andTransferableSkills |
| Programme AcademicStandards that the coursecontribute in achieving | A1, A3 | B2, B4, B5 | C1 | D1, D4, D5,D7 |



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

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

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| Professional andPractical Skills | C1. Apply the professionalengineering technologies inthe field of electrical powerspecialization. | c1.1) Apply different test techniques onthe electrical insulations.c1.2)    Apply    electric    stress    controlmethods.c1.3) Design high voltage laboratory. |
| General andTransferable Skills | D1. Effective communicationof all kinds and sharing ideaswith different relevant teams. | d1.1) Cooperate with the colleagues topresent collaborative work |
| D4. Use of different sourcesfor information knowledge | d4.1) Use specialized books and relatedinternet websites to prepare reports andpresentations. |
| D5. Practice teamwork andtime management. | d5.1) The student well prepared forproject member. |
| D7.           Self-            learningcontinuously     specially     inelectrical power branch. | d7.1) Self-learning and evaluation in thehigh voltage engineering. |

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| ***Week******No.*** | ***Sub. Topics*** | ***Total******Hours*** | ***Contact hrs*** | ***Course ILOs******Covered (By******No.)*** |
| **Lec.** | **Tut.** | **Lab.** |
| *Week-**1* | Test        Techniques       and        StandardProcedures: dry, wet, breakdown tests. | 3 | 3 | - | - | a1.1, c1.1 |
| *Week-**2* | Test Techniques and Standard Procedurescontinue: non-destructive tests | 3 | 3 | - | - | a1.1, c1.1,d1.1, d7.1 |
| *Week-**3* | Test Techniques and Standard Procedurescont.: non-electrical tests | 3 | 3 | - | - | a1.1, c1.1,d1.1, d7.1 |
| *Week-**4* | Electric Fields: types, distribution | 3 | 3 | - | - | a1.2, b2.1,d7.1 |
| *Week-**5* | Electric Fields cont.: calculation | 3 | 3 | - | - | b2.2, d5.1,d7.1 |
| *Week-**6* | Electric Fields cont.: measurements | 3 | 3 | - | - | b2.2, d5.1,d7.1 |
| *Week-**7* | Calculation of Corona Current Pulses andFrequency | 3 | 3 | - | - | b2.3, d5.1,d7.1 |

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| TopicNo. | General Topics | Weeks |
| 1st | Test Techniques and Standard Procedures | 1-3 |
| 2nd | Electric Fields | 4-6 |
| 3rd | Calculation of Corona Current Pulses and Frequency | 7 |
| 4th | Electric Stress Control | 8-9 |
| 5th | Performance of High Voltage Elements and Equipment under Various Conditions | 10-11 |
| 6th | Application of Insulating Materials and Design of High Voltage Laborateries | 12-15 |



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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** |  |  |  |  |  | **x** | **x** |  |  |  |
| a1.2 | **x** |  | **x** |  |  |  |  |  |  |  |  |  |  |
| a1.3 | **x** |  | **x** |  |  |  |  |  | **x** | **x** |  |  |  |
| a1.4 | **x** |  | **x** |  |  |  |  |  | **x** | **x** |  |  |  |
| a1.5 |  | **x** |  |  |  |  |  |  | **x** | **x** |  |  |  |
| a1.6 |  | **x** |  |  |  |  |  |  | **x** | **x** |  |  |  |
| **Intellectual****Skills** | b2.1 | **x** |  | **x** |  | **x** |  |  |  | **x** |  |  |  |  |
| b2.2 | **x** |  | **x** |  | **x** |  |  |  | **x** |  |  |  |  |
| b2.3 | **x** |  | **x** |  | **x** |  |  |  |  |  |  |  |  |
| b4.1 | **x** |  | **x** |  | **x** |  |  |  | **x** | **x** |  |  |  |
| b5.1 | **x** |  | **x** |  | **x** |  |  |  | **x** | **x** |  |  |  |
| b5.2 | **x** |  | **x** |  | **x** |  |  |  | **x** | **x** |  |  |  |
| **Professional****and Practical****Skills** | c1.1 | **x** |  | **x** |  |  |  |  |  | **x** | **x** |  |  |  |
| c1.2 | **x** |  | **x** |  |  |  |  |  | **x** | **x** |  |  |  |
| c1.3 | **x** |  | **x** |  |  |  |  |  | **x** | **x** |  |  |  |
| **General and** | d1.1 | **x** |  | **x** |  |  |  |  |  | **x** | **x** |  |  |  |
| d4.1 | **x** |  | **x** |  |  |  |  |  | **x** | **x** |  |  |  |

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| *Week-**8* | Electric       Stress       Control:       surfacerouphness, grading, barrie. | 3 | 3 | - | - | a1.3, c1.2,d1.1, d7.1 |
| *Week-**9* | Electric Stress Control cont.: surfacerouphness, grading, barrie | 3 | 3 | - | - | a1.3, c1.2,d1.1, d7.1 |
| *Week-**10* | Performance of High Voltage Elementsand Equipment under Various Conditions | 3 | 3 | - | - | a1.4, b4.1,d1.1 |
| *Week-**11* | Performance of High Voltage Elementsand Equipment under Various ConditionsCont. | 3 | 3 | - | - | a1.4, b4.1,d1.1 |
| *Week-**12* | Applications    of    Insulating    Materials:applications     in     power     transformer,applications      in      rotating      machine,applications in circuit breakers | 3 | 3 | - | - | a1.5, d1.1,d4.1 |
| *Week-**13* | Applications    of    Insulating    Materials:applications in cables, applications inpower      capacitors,      applications      inelectronic equipment | 3 | 3 | - | - | a1.5, d1.1,d4.1 |
| *Week-**14* | Design of High Voltage Laborateries:equipment         requirements,         layout,clearances, grounding, facilities | 3 | 3 | - | - | a1.6, a3.1,b5.1, b5.2 ,c1.3, d1.1 |
| *Week-**15* | Design of High Voltage Laborateriescontinue:       equipment       requirements,layout, clearances, grounding, facilities | 3 | 3 | - | - | a1.6, a3.1,b5.1, b5.2 ,c1.3, d1.1 |



**Selflearning**

**Presentation**

**andMovies**

**Cooperative**

**Discovering**

**Discussion**

**Modelling**

**Sitevisits**

**Problem**

**solving**

**Brain**

**storming**

**Tutorial**

**Projects**

**Lecture**

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

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

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| **Transferable****Skills** | d5.1 |  | **x** |  |  |  |  |  |  | **x** | **x** |  |  |  |
| d7.1 | **x** |  | **x** |  |  |  |  |  | **x** | **x** |  |  |  |



**B. 8*Assessments:***

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

***Weighting of assessments:***

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.

***B.10 List of references:***

1. M.S. Naidu and V. Kamaraju, “High Voltage Engineering”, 4th Edition,

McGraw-Hill, New Delhi, 2009.

2. E. Kuffel, W.S. Zaengl and J. Kuffel, “High Voltage Engineering Fundamentals”,

Butterworth-Heinemann , 2000.

3. T.J. Gallagher and A.J. Pearmain, “High Voltage Measurement, Testing and

Design”, Wiley-Interscience, 1983.

4. Recent published journal and international conference papers.

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

**Prof. Dr. Mohamed A. Izzularab** **Prof. Dr. Gamal Morsi**

**Dr. Nehmdoh A. Sabiha**

**Date:**