**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 the  course contribute in achieving | Course ILOs |
| Knowledge&  Understanding | A1.Integrate                theories,  fundamentals and knowledge  of electrical power in practice. | a1.1) Recognize various test techniques  of electrical insulation.  a1.2) Recognize the different types of  electric fields.  a1.3) Identify different methods for  electric stress control.  a1.4)       Recognize        the       different  performance of high voltage equipment  under various conditions.  a1.5) Identify the types of insulating  materials       in       various       electrical  equipments.  a1.6) Describe the common test facilities  available in high voltage laboratories. |
| A3. Know requirements for  safe           operation           and  conservation          of          the  environment. | a3.1) Recognize the extra precautions  that are to be taken while grounding an  impulse current generator in the high  voltage laboratory. |
| Intellectual skills | B2.         Solve         electrical  engineering problems in the  area     of     electrical    power  specialization. | b2.1)        Estimate        electric        fields  distribution.  b2.2) Measure and calculating electric  fields.  b2.3) Calculate corona current pulses  and frequency. |
| B4.    Assess    the    risks    in  professional           engineering  practices. | b4.1) Evaluate the performance of high  voltage     equipment     under     various  conditions. |
| B5. Make career decisions in  the      light      of      available  engineering information. | b5.1) Select a typical grounding system  used in a high voltage laboratory.  b5.2) Estimate the clearances required  and the approximate dimensions of the  test room for a high voltage laboratory. |

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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, 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 and  Practical Skills | C1. Apply the professional  engineering technologies in  the field of electrical power  specialization. | c1.1) Apply different test techniques on  the electrical insulations.  c1.2)    Apply    electric    stress    control  methods.  c1.3) Design high voltage laboratory. |
| General and  Transferable Skills | D1. Effective communication  of all kinds and sharing ideas  with different relevant teams. | d1.1) Cooperate with the colleagues to  present collaborative work |
| D4. Use of different sources  for information knowledge | d4.1) Use specialized books and related  internet websites to prepare reports and  presentations. |
| D5. Practice teamwork and  time management. | d5.1) The student well prepared for  project member. |
| D7.           Self-            learning  continuously     specially     in  electrical power branch. | d7.1) Self-learning and evaluation in the  high 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        Standard  Procedures: dry, wet, breakdown tests. | 3 | 3 | - | - | a1.1, c1.1 |
| *Week-*  *2* | Test Techniques and Standard Procedures  continue: non-destructive tests | 3 | 3 | - | - | a1.1, c1.1,  d1.1, d7.1 |
| *Week-*  *3* | Test Techniques and Standard Procedures  cont.: 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 and  Frequency | 3 | 3 | - | - | b2.3, d5.1,  d7.1 |

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| Topic  No. | 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:       surface  rouphness, grading, barrie. | 3 | 3 | - | - | a1.3, c1.2,  d1.1, d7.1 |
| *Week-*  *9* | Electric Stress Control cont.: surface  rouphness, grading, barrie | 3 | 3 | - | - | a1.3, c1.2,  d1.1, d7.1 |
| *Week-*  *10* | Performance of High Voltage Elements  and Equipment under Various Conditions | 3 | 3 | - | - | a1.4, b4.1,  d1.1 |
| *Week-*  *11* | Performance of High Voltage Elements  and Equipment under Various Conditions  Cont. | 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 in  power      capacitors,      applications      in  electronic 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 Laborateries  continue:       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:**