Course Title	**High Voltage Engineering**
Course Code	**EE5313**
No. of Credit Hrs (Lecture + Tutorial + Lab)	**3 (2+0+1)**
No. of Contact Hrs (Lecture + Tutorial + Lab)	**4 (2+0+2)**
Level-Year	**9/10 – 5**
Prerequisite (if any)	**EE3300**

1) Course Objectives:

The main objective of the course is to familiarize the students with the basic concepts of high voltage generation, measurement and testing techniques. Furthermore, the course includes various properties, applications, conduction and breakdown phenomena for various classes of insulation. It also provides experimental verification and comparison with the theoretical concepts introduced.

2) Expected Learning Outcomes:

1. **Apply** knowledge of mathematics and engineering in high-voltage engineering, electromagnetics, and power engineering applications. **PLO1 [1]**
2. **Describe and explain** ionization processes in gas discharges and related gas phenomena. **PLO1 [1]**
3. **Analyze and interpret** breakdown mechanisms such as Paschen's law, streamer mechanism, vacuum breakdown, and corona discharges. **PLO3 [6]**
4. **Summarize and explain** high-voltage measurement techniques, including direct methods, electrostatic voltmeters, and sphere gaps. **PLO1 [1]**
5. **Design and conduct** laboratory experiments in high-voltage engineering and evaluate experimental outcomes. **PLO3 [6]**
6. **Collaborate** effectively as team members to plan and complete high-voltage engineering projects. **PLO7 [5]**
7. **Communicate** experimental results and technical findings through structured reports and presentations. **PLO8 [3]**

3) Course Contents:

1. Introduction to high voltage (Concepts and types).
2. Generation of high voltage 1.
3. Generation of high voltage 2.
4. Measurements and testing of high voltage.
5. Generalized HV testing circuit.
6. High voltage breakdown theories for insulating materials.
7. Underground cable (operation and construction).
8. Experiment on solid dielectrics.

4) Lab Contents:

1. AC, DC and Impulse Breakdown Test of Insulation
2. Capacitance and Tanδ Measurement of Insulator.
3. Mapping Of Electric Field Lines Between Two Charges Using Matlab
4. Determination of breakdown voltage of solid and liquid insulator.
5. Measurement Of Insulation Resistance of Cable.
6. Oil breakdown test using oil test kit

5) Teaching Methods:

- Lectures and Discussion
- Videos

- Self-learning
- Laboratory demonstrations

6) Mode of Evaluation: Course Assessment Methods

- Quizzes , Assignment, Homeworks, Reports, Presentations etc.
- Lab Work
- Mid Exam
- Final Exam

Evaluation

No	Assessment Activities *	Percentage
1.	Assignments/Quizzes/HomeWorks/Mini-Projects/Presentations/Reports+Quizzes	15%
2.	Mid Exam	25%
3.	Lab/Tutorial (Lab Exam)	10%
4.	Lab/Tutorial (Lab Reports)	10%
5.	Final Exam	40%

7) Textbook(s):

- "High Voltage Engineering Fundamentals", Second Edition, by J. Kuffel, E. Kuffel and W. S. Zaengl (Aug 14, 2000) ISBN: 0750636343.

8) References:

- "High Voltage Engineering", second edition, by M S Naidu & V Kamaraju, McGraw Hill.
- J. Choi, "Introduction of the Magnetic Pulse Compressor (MPC)-Fundamental Review and Practical Application", Journal of Electrical Engineering & Technology Vol. 5, No. 3, pp. 484~492, 2010.
- A. A. Al-Arainy, M. I. Qureshi and N. H. Malik, "Fundamentals of High Voltage Engineering" King Saud University Press, 2005.