

ELEG 4503 – Design of Advanced Electric Power Distribution Systems

Credits and Contact Hours

Three credit hours, 45 hours of instructor contact

Instructor's Name

Dr. Juan Carlos Balda

Textbook

Electric Power Distribution System Engineering, Second Edition, Turan Gonen, CRC Press, 2008

a. Other supplemental materials: Blackboard website and instructor Powerpoint slides

Specific Course Information

a. Catalog description

Design considerations of electric power distribution systems, including distribution transformer usage, distribution system protection implementation, primary and secondary networks design, applications of advanced equipment based on power electronics, and use of capacitors and voltage regulation. Students cannot receive credit for both ELEG 4503 and ELEG 5503.

b. Pre-requisites or co-requisites:

ELEG 3304 – Energy Systems

c. Technical Elective

Specific Goals for the Course

1. Specific outcomes of instructions

Undergraduate electrical engineering students become knowledgeable regarding the design of electric power distribution systems encompassing not only traditional topics but also topics related to future electric energy systems or the smart grid. Students will be able to understand the use of power electronic interfaces in the smart grid, arrangements used for power substations and overhead/underground distribution systems, select and apply protection equipment for distribution systems, and perform an analysis of voltage regulation in distribution systems.

2. Indicate the student outcomes listed in Criterion 3 addressed by the course

OUTCOME	HOW IT WAS ADDRESSED
(a)	Students analyze electric circuits consisting of distribution feeders; they perform steady state analysis, fault current calculations, dimensioning of components, etc.
(b)	Not addressed
(c)	Students are given a distribution feeder to develop the protection methodology and a residential subdivision to design its distribution system
(d)	Not addressed
(e)	Students must solve problems encountered by practicing power engineers; for example, developing the protection methodology for distribution feeders or the design of a residential subdivision
(f)	The syllabus of the course addresses the IEEE Code of Ethics
(g)	Students write a comprehensive report, like the one submitted to a customer, when designing the distribution system for a residential subdivision
(h)	Not addressed
(i)	Not addressed
(j)	Not addressed
(k)	Students use PSpice for fault current calculations of simple distribution systems and Excel for coordination of protection equipment

List of Topics

1. Smart Grid - Advanced Power Electronic Controllers in Distribution Systems (3 classes)
2. Chapter 3: Application of Distribution Transformers (6 classes)
3. Chapter 4: Design of Sub-transmission Lines and Distribution Substations (4 classes)
4. Chapter 5: Design Considerations of Primary Systems (2 classes)
5. Chapter 10: Distribution System Protection (6 classes)
6. Chapter 9: Distribution System Voltage Regulation (3 classes)
7. Chapter 8: Applications of Capacitors to Distribution Systems (2 classes)