



Department of Electrical and
Computer Engineering

ECE668: DISTRIBUTION SYSTEM ENGINEERING Winter Term 2025

Course Description:

This course provides the students an understanding of the operation, analysis and design of electric power distribution systems, starting with estimation of the loads on the network to the detail design of the distribution system networks. The primary objective of the course is to provide students with the skills to understand the analytical and design methods and modern tools for solution of problems associated with electric distribution system engineering

Objectives:

- Study distribution system elements and components.
- Study the economical operation of distribution systems.
- Study the protective schemes and devices for distribution systems.
- Study the planning and expansion methodologies of distribution system.

Detailed Description:

	Lectures
1. Load characteristics and load forecast	6
- Basic definitions- load definitions, load factor definitions, diversity principle in distribution systems	
- Load Forecast- factors affecting load forecasting methods, small areas load forecasting, spatial load forecasting methods, simulation, trending and mixed load forecasting methods	
2. Distribution system planning, automation and control	9
- Short term planning	
- Long term planning	
- Dynamic planning	
- Structure of distribution automation	
- Essential component of distribution automation	
- Automation of distribution system components	
- Load management	
3. Sub-transmission and substation design	6
- Sub-transmission networks configurations	
- Substation bus schemes	
- Distribution substations ratings	
- Service areas calculations	
- Substation application curves	
4. Primary and secondary system design considerations	6
- Primary circuit configurations	

- Primary feeder loading
- Secondary networks design
- Economic design of secondaries
- Unbalance loads and voltage considerations

5. Distribution system performance and operation

9

- Voltage drop calculation for distribution networks
- Power loss Calculation
- Application of capacitors to distribution systems
- Application of voltage regulators to distribution systems

References:

- *Electric Power Distribution System Engineering*, T. Gonen, 2nd edition, CRC, 2007, ISBN 978-1-4200-6200-7
- *Distribution System Modeling and Analysis*, W. H. Kersting, 3rd edition, CRC, 2012
- *Electric Power Distribution Handbook*, Thomas Allen Short, CRC Press
- *Power distribution engineering: fundamentals and applications*, James J. Burke, M. Dekker, New York, 1994.
- *Electrical power distribution and transmission*, Lucus M. Faulkenberry, Prentice Hall, 1996.

Prerequisites:

Basic knowledge of power system operation, analysis and protection

Instructor:

Ramadan El-Shatshat, E3-4111, Ext. 37063

Marking Scheme:

Term project ----- 30 %
 Assignments ----- 10 %
 Final Exam ----- 60 %

Timetable:

Three hours lecture every week.

Contingency Plan & Alternative Arrangements for Cancellations and Covid Implications

- In the case of a short-term (e.g., one-week) cancellation of in-person classes, whether for the course or University-wide, classes will be rescheduled during the following weeks.
- In the case of a long-term cancellation of in- person meetings, whether for the course or University-wide; classes will be held online, with lectures hosted on WebEx and recorded lecture material will be posted on LEARN.
- In the case of a cancellation of in-person (midterm or final) examinations, an online version of the examination will be given to students via email, with the same time period as the cancelled in-person examination to complete the examination. Detailed instructions will be sent to students, outlining how to complete the examination before the online examination date.
- For students who cannot attend classes due to self-isolation, recorded lecture material will be accessible to these students and if more clarification or support is needed, a scheduled meeting via WebEx will be held.