

STUDY GUIDE FOR
POWER DISTRIBUTION ENGINEERING
EEV732

Compiled by
Dr. R. Naidoo

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1. Lecturer and secretary

Lecturer: Dr R. Naidoo
Office: 2-23 Eng. II Building
Main Campus
University of Pretoria
Mail address: Dept. of Electrical, Electronic and Computer Engineering
University of Pretoria
Pretoria
0002
Telephone: +27 12 420-5239
Fax number: +27 12 349-8332
E-mail address: raj@up.ac.za
Consulting hours: Strictly by appointment

2. References

2.1 Prescribed text

There is no prescribed textbook for this course. Notes will be provided.

2.2 Recommended text

1. "Power System Analysis" by Haadi Saadat, 2nd Edition, 2002, ISBN: 0-07-284869-3.
2. "Electrical Power Systems Quality" by McGranaghan M.F, Dugan R.C. and Beaty H.W., 1996, ISBN 0-07-018031-8

3. Course objectives and study themes

This course deals with the essential aspects of distribution system engineering, starting with estimation of the loads on the network to the detail design of the distribution system networks. The contents of this course are divided into three categories; Planning, design and operation. In the planning part load forecasting, and planning strategies as well as distribution automation are discussed. The design part includes the design of sub-transmission lines, distribution substations, and primary and secondary systems

design considerations. The operation part includes the voltage drop and power loss calculations, voltage regulation and application of capacitor to distribution systems.

Objectives

1. To provide a good understanding of different distribution system elements
2. To introduce state of the art techniques in planning and automation of distribution systems
3. To train distribution engineers on how to operate optimally the distribution networks
4. To enhance the design aspects of distribution system components.

Main Topics and Delivery Plan

1. Load characteristics and load forecast
2. Distribution system planning, automation and control
3. Sub-transmission and substation design
4. Primary and secondary system design
5. Distribution system performance and operation
6. Power Quality

Study Themes

Theme 1: Introduction to the distribution system

The student will be introduced to the power system.

- Introduction
- Electric Industry Structure
- The Modern Power System
- System Protection
- Energy Control Centre
- Computer Analysis
- Power Factor
- Balanced Three Phase Power

References: Saadat, Course Notes

Theme 2: Load modelling

In this theme, the student is exposed to the following:

- Modelling of different types of loads in the distribution system
 - Constant current, power and impedance models
 - Composite Loads
 - Loads including frequency effects
 - Aggregate loads
- Understanding the following factors for evaluating loads
 - Demand

- Maximum demand
- Load duration curve
- Loss
- Power etc.

References: Course Notes
Assignment 1 Due

Theme 3: Distribution system network planning and design

- Planning functions of a distribution system
- Master planning, network development planning, project planning etc.
- Planning information requirements
- Load forecasting

References: Saadat, Course Notes
Assignment 2 Due

Theme 4: Voltage regulation

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

References: Saadat, Course Notes
Assignment 3 Due

Theme 5: Reliability and power quality

- Reliability indices
- Power Quality
 - Dips
 - Harmonics
 - Unbalance
 - Flicker
 - Capacitor Switching

References: McGranaghan, my notes, self study
Assignment 4 Due

4. Assessment

Grading policy

The final mark for EEV732 will consist of a *semester mark* (50%) and an *examination mark* (50%). The semester mark is based on evaluation during the semester, and the examination mark is based on a substantial final assignment.

The semester mark and final mark are made up as follows:

	% of semester mark	% of final mark
Assignment 1	10%	5%
Assignment 2	10%	5%
Assignment 3	10%	5%
Assignment 4	10%	5%
Practical 1	20%	10%
Semester Test 2	40%	20%
Examination assignment	-	50%
TOTAL:	100%	100%

Class attendance

Class attendance during mini-block weeks is mandatory.

Semester tests

A closed-book semester test of two hours will be written in the second mini-block.

Examination refusal

Students with semester marks below 40% will not be allowed to attempt the final examination assignment.

Final examination

An examination assignment will be sent out towards the end of May 2010 to be completed at home and submitted by the due date.

Ethics

Students are encouraged to discuss course work with each other, especially during mini-block weeks. *However, each student should hand in his/her own work for assignments. Plagiarism, including copying the work of another student and copying from the Internet, is absolutely unacceptable. Dishonesty such as plagiarism during tests and the final exam can be punished by expulsion from the University.*

In addition, please note the following (provided by the University's Legal Services Department):

“Under the definitions of misconduct a student is guilty of misconduct if he/she is guilty of any conduct that infringes copyright or any other form of the law of immaterial property and such conduct proves to be detrimental to the University.

The inclusion of the work of other authors (literacy works) in dissertations and theses has to be done in accordance with the provisions of the Copyright Act, 98 of 1978. This Act states that the copyright in a literary work (also if made available electronically) shall not be infringed by a short quotation therefrom provided that the source shall be mentioned as well as the name of the author. Non-compliance with these provisions will therefore not only be a contravention of the Rules of the University, but also a crime in terms of the South African Law”.

5. Assignments

Four assignments are due for this course. A brief description of each, as well as due dates, is given below. More detail will be provided in due course.

Assignment 1: Due – to be advised

This will cover theme 1.

Assignment 2: Due – to be advised

This will cover theme 2 and 3.

Assignment 3: Due – to be advised

This will cover theme 4.

Assignment 4: Due – to be advised

This will cover theme 5.

Practical:

Students will perform the practical during the mini-blocks. A formal report documenting results is expected to be submitted by the student.

Examination Assignment: end May 2010

The exam assignment will be given to students towards the end of May 2010. It is required to be completed and submitted back to the lecturer within the prescribed time.