Transmission and distribution of energy

Academic Year: (2019 / 2020) **Review date: 08/05/2020 20:52:56**

Department assigned to the subject: Electrical Engineering Department

Coordinating teacher: LEDESMA LARREA, PABLO

Type: Compulsory ECTS Credits : 6.0

Year : 3 Semester : 2

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Solution of AC electrical circuits using phasors (e.g. Electrical Power Engineering Fundamentals in UC3M)

OBJECTIVES

By the end of this content area, students will be able to:

1. know and understand the scientific and mathematical principles underlying the analysis and design of power systems
2. systematicly understand the key aspects and concepts of power system operation
3. apply their knowledge and understanding to identify, formulate and solve power system problems using established methods
4. apply their knowledge and understanding to design power systems that meet specified requirements
5. demonstrate computer skills applying software tools to the analysis of power systems
6. combine theory and practice to solve power system problems
7. use diverse effective methods to communicate orally with the engineering community and with society at large

DESCRIPTION OF CONTENTS: PROGRAMME

Transmission and distribution grids
- Transmission voltages
- Meshed and radial grids
- Power quality
- Basic mathematical models of lines, transformers, loads and generators
- Per unit quantities

Power lines
- Conductors
- Insulators
- Pylons
- Mechanical tension
- Mathematical models of a line
- Power flow and voltages in a line
- Corona effect

The power flow problem
- Power flow equations
- Newton-Raphson method
- Modified N-R methods

Voltage control
- Shunt-connected coils and capacitors
- Automatic voltage regulation in power plants
- Tap changer transformers

Ferranti effect
Voltage control in a distribution system
Voltage control in a transmission system

Substations
Disconnectors
Circuit breakers
Measurement transformers
Substation configurations

Frequency control
Primary regulation
Secondary regulation
Tertiary regulation

Protection systems
Characteristics of a protection system
Time/current relay
Fault clearing time and transient stability

Emerging technologies in power systems
Energy load management
Electric vehicles
Smart meters
Smart grid

LEARNING ACTIVITIES AND METHODOLOGY

Practical work in the computer laboratory
Theoretical classes
Solution of practical problems in class
Individual tutorials
Individual presentations of the students

ASSESSMENT SYSTEM

% end-of-term-examination/test:	40
% of continuous assessment (assigments, laboratory, practicals…):	60

Continuous Assessment: (AS*0.8 + QZ*0.1 + OP*0.1)*AT
where
- AS = Assignments
- QZ = Quizzes
- OP = Oral presentation
- AT = Attendance and participation

Ordinary call:
- Continuous assessment 60%
- Final exam 40%

Extraordinary call:
Most favorable option between
- Continuous assessment 50%
- Final exam 50%
and
- Final exam 100%

BASIC BIBLIOGRAPHY

- Grainger, Stevenson Power System Analysis, McGraw-Hill.

- P. Kundur Power System Stability and Control, EPRI.

- Pieter Schavemaker; Lou van der Sluis Electrical Power System Essentials, John Wiley & Sons, 2008