

Academic Year: ( 2019 / 2020 )

Review date: 30/04/2019 13:02:38

Department assigned to the subject: Electrical Engineering Department

Coordinating teacher: ALONSO-MARTINEZ DE LAS MORENAS, JAIME

Type: Electives ECTS Credits : 6.0

Year : 4 Semester : 2

## OBJECTIVES

After this course, the student will be familiar with the main distributed generation technologies and the main implications, both technical and economic of its integration in an existing grid.

The student should therefore be able to describe the behaviour, analyze, size and design distributed generation systems, either isolated or connected to another grid.

He should be able to choose the most appropriate technology, given a certain objective, taking into account the modifications needed by the existing grid protections, understanding the impact in power quality (reliability, system voltages, etc.) and assessing the corresponding costs.

The student should be able to simulate and design a small system of medium complexity that includes all the previous aspects.

## DESCRIPTION OF CONTENTS: PROGRAMME

1. Overview
  - (a) A definition for Distributed Generation
  - (b) Electric systems evolution
  - (c) Distributed Generation versus Conventional Generation
  - (d) Reasons for Distributed Generation. Future of electric systems
  - (e) Main technical and economic impacts in the electric system
2. Distributed Generation technologies and their connection to the system
  - (a) Generation technologies (Piston engines, Gas turbines, Fuel cells, Renewable sources, Storage systems)
  - (b) Connection types (Synchronous generators, Induction generators, DFIG, Full converter topologies)
  - (c) Operating modes (Isolated systems, Parallel operation, Islanding)
3. Technical impacts of DG in electric system
  - (a) Power flows
  - (b) Voltages
  - (c) Demand in DG systems
  - (d) Generation-demand balance
  - (e) Fault currents in DG systems
  - (f) Protections for DG
  - (g) Influence in existing system protections
4. DG in system planning
  - (a) Planning process
  - (b) Effects on reliability
  - (c) Economics of DG
  - (d) Environmental impact
5. DG and emerging grid concepts
  - (a) Active grid management
  - (b) Virtual generation plants

- (c) Microgrids
- (d) Smart Grids

<b>% end-of-term-examination/test:</b>	50
<b>% of continuous assessment (assignments, laboratory, practicals...):</b>	50