COURSE INFORMATION

ELECTRIC POWER SYSTEMS

Code number: 606711215
Degree: Energy Engineering
Department: Electrical & Thermal Engineering
Year: 2017-2018
Course type: Compulsory. 3rd year
First semester: 1.5 hours per sessions; 2 sessions per week
Credit value: 6 ECTS
Link to Spanish counterpart: http://www.uhu.es/etsi/guia-de-asignatura/?codigo=606711215

TEACHING STAFF

Instructor: Dr. José Antonio Dueñas Díaz
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Office hours:*
First Semester:*
Second Semester:*

* Faculty move in progress, information about rooms and offices will be updated shortly.

PROGRAMME

1. DESCRIPTION

The Electric Power System course aims to provide its students with a good understanding of the fundamental concepts of power system analysis and their applications to real-world problems, with particular focus on the modeling of the electric power system components. To help provide this insight, the course uses PowerWorld Simulator to integrate computer-based examples, problems and design projects.

2. PREREQUISITES

Students should have a good theoretical knowledge of both DC & AC circuit analysis, as well as a knowledge of three-phase electric power.

3. OBJECTIVES & LEARNING OUTCOMES

The objective of this course is to present methods of power system analysis and design with the aid of a personal computer, in sufficient depth to give the student the basic theory at the undergraduate level. The approach is designed to develop students' thinking processes, enabling them to reach a sound understanding of a broad range of topics related to power system engineering, while stimulating their interest in the electrical power industry. Both theory and modeling are developed from simple beginnings so that their knowledge can be extended, allowing them to cope with new and complex situations.

4. COMPETENCES
E02, CG01, CG04, CG06, CG07, CG17, T01

5. TEACHING METHODOLOGY
The following methods will be employed:

- Lectures by teacher where the teacher's primary role is to coach and facilitate student learning and overall comprehension of the material.
- Class discussion conducted by teacher where students play an active role in the learning process.
- Practicals using computer-based simulator to help student see the details of how a problem is solved.
- Project-based learning in engineering where students are given a task to solve, involving mostly a background search of an interesting problem or a topic related to the subject.
- Tutorials where small groups of students discuss issues, essays or a topical problem. Also individual or personal tutorials.

6. CONTENTS

1. TRANSFORMER MODEL & THE PER-UNIT SYSTEM
    1.1. Introduction
    1.2. Power transformer
    1.3. The Per-Unit system
    1.4. Regulating transformer
    1.5. Three-Winding transformer
2. TRANSMISSION LINE MODEL
    2.1. Introduction
    2.2. Line parameters
    2.3. Line model
    2.4. Lossless line
    2.5. Line compensation
    2.6. Line transient analysis
3. BALANCED FAUL
    3.1. Introduction
    3.2. Fault far from a generator
    3.3. Fault at the terminal of a generator
    3.4. Balanced three-phase fault
    3.5. Bus impedance matrix
    3.6. Protections
4. UNBALANCED FAULT
    4.1. Introduction
    4.2. Symmetrical components
    4.3. Systematic fault analysis
    4.4. Fault models
    4.5. Systematic faults analysis using bus impedance matrix

LABORATORY
1. Line model and power flow
2. Power flow control

3. Voltage control of transformer
4. Electromagnetic transients
5. Line flows and losses
6. Balanced three-phase faults
7. Unbalanced faults

7. BIBLIOGRAPHY

1. POWER SYSTEM ANALYSIS, S.H. Saadat, McGraw-Hill, 2004.
2. POWER SYSTEM: ANALYSIS & DESIGN, J.D. Glover, M.S. Sarma, T.J. Overbye, Cengage Learning, 2012.

8. ASSESSMENT

The following methods will be employed:

- Written exam. The written examination contains two parts, the first consisting of 40 questions (short answers just a few words, no multiple choice), and the second of 4 problems. This will be the 70% of the final mark.
- Laboratory session. Computer simulation of electrical power systems employing PowerWorld software. Students will be given a schematic of a power system to be modelled and analysed. This will be the 20% of the final mark.
- Voluntary assignment. Students may or may not undertake a small project where he or she will propose a course-srelated theme. Any media tool can be employed. No public presentation is required. This will be the 10% of the final mark.

Final results will be given in terms of a numerical scale between 0 and 10 (including tenths), with the corresponding qualitative ratings below:

- ≤4.9: Fail (D)
- 5.0 - 6.9: Pass (C)
- 7.0 - 8.9: Pass with Merit (B)
- 9.0 - 10: Distinction (A)

The total number of distinctions cannot exceed 5% of the students enrolled in the subject in the academic year (unless the number of students enrolled is lower than 20, in which case one distinction can be awarded).

The grading system is subject to the Bachelor's Degree Exam Regulations of the University of Huelva (Normativa de Evaluación para las Titulaciones de Grado de la Universidad de Huelva). Please refer to:

(*http://www.uhu.es/sec.general/Normativa/Texto_Normativa/Normativa_de_Evaluacion_grados.pdf*

(In particular, please note that make-up exams and other special circumstances will be subject to article 19 of these regulations.'