Computer-aided power system modelling

Academic Year: (2023 / 2024) **Review date: 30-03-2023**

Department assigned to the subject: Electrical Engineering Department

Coordinating teacher: LEDESMA LARREA, PABLO

Type: Electives ECTS Credits : 6.0

Year : Semester : 2

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Fundamentals of Electrical Engineering

SKILLS AND LEARNING OUTCOMES

CB1. Students have demonstrated possession and understanding of knowledge in an area of study that builds on the foundation of general secondary education, and is usually at a level that, while relying on advanced textbooks, also includes some aspects that involve knowledge from the cutting edge of their field of study.
CB2. Students are able to apply their knowledge to their work or vocation in a professional manner and possess the competences usually demonstrated through the development and defence of arguments and problem solving within their field of study.
COCIN4. Ability to resolve problems with initiative, decision-making, creativity, and critical reasoning skills and to communicate and transmit knowledge, skills and abilities in the Industrial Engineering field.
COCIN5. Knowledge to perform measurements, calculations, assessments, appraisals, surveys, studies, reports, work plans and other similar jobs.
CEP1. Capacity to design a system, component or process in the area of electrical engineering in compliance with required specifications.
CEP2. Knowledge and ability to apply computational and experimental tools for analysis and quantification of electrical engineering problems.
CEB3. Basic knowledge of the use of computer programming, operating systems, databases, and computer programs with engineering applications.
ECRT6. Knowledge of electrical power systems and applications.

By the end of this content area, students will be able to have:
RA1.3. Coherent knowledge of the branch of electrical engineering including some at the forefront of their branch in electric power systems.
RA2.3. The ability to select and apply relevant analytic and modelling methods in electric power systems.
RA3.2. An understanding of design methodologies for electric power systems, and an ability to use them.
RA4.1. The ability to conduct searches of literature, and to use data bases and other sources of information.
RA4.3. Workshop and laboratory skills.
RA5.1. The ability to select and use appropriate equipment, tools and methods in electric power systems.

OBJECTIVES

The student will be able to:
- Explain the differences between a electromagnetic transients program and a electromechanical transients program
- Explain the scope of the power system analysis software tool PSS/E
- Enumerate the data needed to solve a power flow
- Use these data to solve a power flow in PSS/E
- Perform a contingency analysis in PSS/E
- Perform a voltage stability analysis in PSS/E
- Perform an optimal power flow in PSS/E
- Enumerate the data needed to simulate a severe perturbation in a power system
- Use these data to execute a dynamic simulation in PSS/E
- Extract relevant information from the output of a dynamic simulation
- Perform these tasks in PSS/E automatically

DESCRIPTION OF CONTENTS: PROGRAMME

- Electromagnetic transient simulation
- Power flow
- Contingency analysis
- Economic dispatch
- Voltage stability
- Optimal power flow
- Electromechanical transient simulation
- Synchronous generator models
- Protections

LEARNING ACTIVITIES AND METHODOLOGY

Classroom sessions, in which the teacher will explain the theoretical contents.

Practical sessions in a computer room. The student will use software tools commonly used by the electric utilities, specially PSS/E. The student will apply the theoretical concepts to practical examples.

ASSESSMENT SYSTEM

The continuous assessment mark is A*T, where
A is the attendance mark
T is the mark of the works performed along the course.

If the grade obtained in the continuous assessment is equal or more than 6 over 10, then it is not necessary to do the end-of-term examination. In this case, the final grade will be that of the continuous assessment.

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

BASIC BIBLIOGRAPHY

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