

Course Unit Description - (OPSEE)

(Power Systems Planning and Operation)

(Mestrado em Engenharia Electrotécnica - Sistemas Eléctricos de Energia)

Academic year: 2009/2010

Subject group: Sistemas de Energia

	Semestral	Optional
Mode of study	Diurno	Hours/Week T-Teórica
Year	1 ^o	PL-Prática-Laboratorial
Semester	1 ^o	OT-Orientação Tutorial

ECTS 7.5

Objectives

Electric Systems Planning and Operations is a curricular unit that belongs to the 1st semester of the 1st year of Electric Energy Systems Master. This curricular unit provides students the full use of knowledge on Electric Power Systems equipment and constitution. in an integrated way and relates to planning and operation issues of Power Systems.

This curricular unit aims the development of knowledge in Electric Power Systems planning and operation. Issues regarding optimization and taking into account economical aspects in the planning and operation of Electric Power Systems. Regarding Electric Power Systems operation a special attention is given to data acquisition on Dispatch Centers.

Course Contents

1. Electric Power Systems Planning and Operation
 - General considerations. Historical perspective and future evolution
 - Electric Power Market restructure
 - Data transmission and acquisition on Dispatch Centers
 - Supervisory and Data Acquisition Systems (SCADA).
 - Environment impact and economic evaluation
2. Electric Power Systems Operation. State Estimation on Electric Power Systems
 - State estimation goals and importance.
 - Estimation, error and statistical treatment.
 - State Estimation Algorithms and methods.
 - Error detection.
3. Economical Issues on Electric Power System Dispatch
 - Generation dispatch
 - Unit Commitment on one power plant
 - Unit Commitment on several power plant
 - Transmission losses consideration.
 - Optimal Dispatch
4. Electric Power Systems Control.
 - Goals
 - Control and Supervision Centers
 - Frequency Control
 - Automatic generation Control
 - Interconnected Systems Control
 - Steady State and Emergency State Operation

Recommended reading

- Gilbert M. Masters, "Renewable and Efficient Electric Power Systems", John Wiley & Sons, 2004
- J. Grainger, W. Stevenson, "Power System Analysis", McGraw-Hill International Editions, 1994
- M. El-Hawary, "Electrical Power Systems: Design and Analysis", Wiley IEEE Press, 1995
- Saccomanno, F., "Electric Power Systems: Analysis and Control", Wiley IEEE Press, 2003
- Shahidepour, M., Wang, Y., "Communication and Control in Electric Power Systems: Applications of Parallel and Distributed Processing", Wiley IEEE Press,
- J. Sucena de Paiva, "Redes de Energia Eléctrica – uma análise sistémica", IST Press, 2005
- J. Beleza Carvalho, "Estimação de Estado em Sistemas Eléctricos de Energia", ISEP

Teaching Methods

The Lecture classes (2 hours/week) are used to present the different issues and for discussion and analysis of several real cases.

The Laboratory Classes (2 hours/week) are used for problems presentation, resolution and discussion using computer applications.

Tutorial Classes (2 hours/week) are used for supervision and support for studies regarding the viability of a Power Plant installation in Portugal.

Assessment methods

The assessment in the discipline has 2 components. The component NF (to footnote frequency), corresponding evaluation during the school term, and the component PE- written exam.

NF component. Evaluation during the school term

The assessment during the school has a weight of 60% in the final classification. This note is also based on frequency of two components N1 and N2.

- Component N1 of note Frequency

The N1 component is based on the evaluation of the performance of students in solving exercises and practical work that will be proposed as part of the laboratory practice and to be published at the beginning of the academic semester. It is part of this core component of the assessment, the performance achieving the proposed work and the use of IT tools required for their resolution. This work can be done during class and presence outside the classroom resolution of this work must be delivered to school teachers of laboratory practice until the last week of the semester teaching. This component N1 has a weight of 30% in the evaluation of the frequency of the note.

- N2 component of note Frequency

This N2 component based on the assessment of the work that is offered to students in the classes of OT. This work consists mainly of a feasibility study for implementation of a central production of high-power electricity in Portugal. To obtain this evaluation component, students must submit a written report on the last week of classes. The N2 component has a weight of 70% in the evaluation of the frequency of the note.

The assessment corresponding to the note by frequency (NF) will be:

$$NF = 0,3 * N1 + 0,7 * N2$$

To gain advantage in the discipline is necessary to note at least for this component of NF 8 values.

- Students with exemption of continuous assessment.

These students are exempt from the assessment during the school term, however, will be forced to perform the work planned for the classes Laboratory Guidance and Tutorial classes (OT). For these students, the final score will correspond to a note weighted with 40% of the note obtained in the test of exercises of the note obtained in solving exercises / work proposed at the beginning of the academic semester under the lessons of laboratory practice, and 40% of the note obtained in the evaluation of the proposed work in the classes of OT.

PE component. written exam

The evaluation of the written exam has a weight of 40% in the final classification. The proof of examination could be held in normal times or appeal, in accordance with existing legislation. Consist mainly of a written test, with theoretical issues addressed in theoretical and practical exercises covered in class-laboratory practice.

- Students entitled to special examination of season

For these students the final score in the discipline will take into account the classification obtained in the corresponding component of the note frequency. Students with exemption of continuous assessment, the final score will take into account the note obtained on the proposed work in the classes of OT and the note obtained in solving exercises / work proposed at the beginning of the academic semester in school for laboratory practice. The proof of examination will be the whole matter.

The answer to these tests will be done only with use of the distributed or shown by teachers, and, where necessary, distributed forms and tables listed in evidence. While performing the tests students can use calculators.

To gain advantage in the discipline, the note minimal component of this evaluation will be of 10 values.

PE. written exam

It represents 40% of the total classification.

There is a minimum classification of 10 for PE.

Final Classification: $CF = 0,6 * NF + 0,4 * PE$

Minimum : NF = 8

Minimum: PE = 10

Students with exemption of continuous assessment.

$CF = 0,2 * (\text{classification of Laboratory work}) + 0,4 * (\text{classification of Tutorial work}) + 0,4 * PE$

-Improvement of Note (assessment)

Will be carried out during periods and within the deadlines set by law and only for the examination of evidence. The improvement of note will be taken into account the score in the proposed work in the classroom of OT and the note obtained in solving exercises / work proposed at the beginning of the academic semester in school for laboratory practice. The proof of examination will be made by the whole matter.

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