COMILLAS
UNIVERSIDAD PONTIFICIA
ICAI ICADE CIHS

Syllabus
2022 - 2023

GENERAL INFORMATION

Data of the subject	
Subject name	Electric Power Systems
Subject code	DIE-GITI-323
Mainprogram	Bachelor's Degree in Engineering for Industrial Technologies
Involved programs	Grado en Ingeniería en Tecnologías Industriales [Third year]
Level	Reglada Grado Europeo
Quarter	Semestral
Credits	6,0 ECTS
Type	Compulsory
Department	Department of Electrical Engineering
Coordinator	Enrique Lobato MIguélez
Schedule	2 sessions of 2 hours in the evening

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DESCRIPTION OF THE SUBJECT

Contextualization of the subject

Prerequisites

- Circuit theory (DC and AC) and resolution knowledge
- Electric Machines
- Statistics

Course contents

Contents

Theory:

1. Introduction
2. Voltage Control of Power Systems

   2.1 Review of elements of Power Systems (Lines, Transformers, Generators, Loads)

   2.2 Power Flow Computation

   2.3 V/Q Control

3. Load-Frequency Control of Power Systems (f/P Control)

   3.1 Primary Regulation

   3.2 Secondary Regulation

4. State Estimation

Laboratory:
P1. Power flow analysis I (with PSS/E) - 2 h (after completion of theory unit 2.2)
P2. Power flow analysis II (with PSS/E) - 2h (after completion of theory unit 2.3)

P3. Single Area Primary Load-Frequency simulation (with Matlab-Simulink) – 2h (after completion of theory unit 3.1)

P4. Secondary Multiarea Secondary Load-Frequency simulation (with Matlab-Simulink) – 2h (after completion of theory unit 3.2)
P5. State Estimation (with Excel) -2h- (after completion of theory unit 4)

EVALUATION AND CRITERIA

Evaluation activities	Evaluation criteria	Weight
Final exam	Comprehension of concepts through test questions Application of concepts to the resolution of practical problems Analysis and interpretation of the results obtained in the resolution of problems Presentation and written communication	56 %
Interim exam	Comprehension of concepts through test questions Application of concepts to the resolution of practical problems Analysis and interpretation of the results obtained in the resolution of problems Presentation and written communication	24 %

Laboratory sessions	Previous reading and preparation of lab sessions Oral communication, reasoning and justification Critical analysis of the results obtained in lab sessions Presentation and written communication Ability to use the simulation programs used in lab sessions	20 %

Grading

Grading in 1st call

Total Grading: 80% Theory + 20% Laboratory.
Theory (over 100%): 30% intermediate follow-up test, 70% final exam.
Laboratory (over 100%): 75% preparation and lab sessions reports, 25% final practical exam. In order to weight the note on preparation and lab reports in the laboratory note, it is necessary to obtain at least a score of 5 out of 10 in the final laboratory exam. If the laboratory exam grade is less than 5, the laboratory grade will coincide with the laboratory exam grade, and therefore the student will fail and must repeat the laboratory exam in the extraordinary call.

To pass the course a minimum grade of 5 in theory and laboratory is required. If one part is passed and another is failed, the score of the failed part will be the overall grading and the score of the passed part will be kept until the extraordinary call.

Attendance at practices is mandatory. Any practice that is not attended, the note of zero will appear in the lab session report for the absent student. If a lab session report is not delivered within the established deadline through Moodle, a zero will appear in all the members of the laboratory group. Additionally:

The absence to two lab sessions or more will entail the loss of the ordinary call
The absence to three lab sessions or more, will entail the loss of the ordinary and extraordinary call.
It is not allowed in any case (justified or not) to carry out a lab sessions on another day or another group assigned to the group to which the student belongs.
It is not allowed in any case (justified or not) to deliver a lab sessionsafter the established term through Moodle.

Failure to attend more than 15% of the classes may result in the loss of the right to take the ordinary call exam (and even the extraordinary call) of the subject (article 93.3 of the General Regulations, and articles 7.2 and 7.3 of the Academic Norms)

Grading extraordinary call

Total Note: 80% Theory + 20% Laboratory
Theory (over 100%): 30% intermediate follow-up tests, 70% extraordinary call exam.
Laboratory (over 100%): 75% grade obtained by the student in his continuous evaluation of the laboratory (preparation and test reports), 25% extraordinary call exam. In order to weight the note on preparation and reports in the laboratory note, it is necessary to obtain at least a score of 5 out of 10 in the final laboratory exam. If the laboratory test mark is less than 5, the laboratory mark will coincide with the laboratory test mark, and therefore it will fail.

To pass the course a minimum grade of 5 in theory and laboratory is required. If one part is approved and another is suspended, the score of the suspended part will be the final grade. If the subject is failed, the note of the passed part will not be kept for the following academic year.

Failure to attend more than 15% of the classes may result in the loss of the right to take the ordinary call exam (and even the extraordinary

call) of the subject (article 93.3 of the General Regulations, and articles 7.2 and 7.3 of the Academic Norms)

WORK PLAN AND SCHEDULE

Activities	Date of realization	Delivery date
Interim exam	Week 8	Week 8
Final exam	End of the course	End of the course
Lab sessions	Weeks 5,7,11,13,15	
Study of theory conceps	After each theory session	
Preparation of lab sessions reports	Weeks 5,7,11,13,15	Weeks 6,8,12,14,16

BIBLIOGRAPHY AND RESOURCES

Basic References

Electric Energy Systems: Analysis and Operation (Electric Power Engineering Series) 1st Edition, CRC press, edited by Antonio Gomez-Exposito (Author), Antonio J. Conejo (Author), Claudio Canizares (Author)

Power Generation Operation & Control". Wood, A.J. - Wollenberg, B.C. John Wiley.

Electric Energy Systems Theory. An introduction. O.I. Elgerd. Ed. McGraw-Hill