

Course guide 240IEL11 - 240IEL11 - Methods and Analysis Techniques for Electrical Engineering

Last modified: 16/05/2023

Academic year: 2023	ECTS Credits: 4.5 Languages: Catalan		
Degree:	MASTER'S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2014). (Optional subject).		
Unit in charge: Teaching unit:	Barcelona School of Industrial Engineering 709 - DEE - Department of Electrical Engineering.		

LECTURER

Coordinating lecturer: Pedra Duran, Joaquin

Others:

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

CEEELEC1. Model, analyse, calculate and design power electronic systems..

TEACHING METHODOLOGY

During the development of the subject the following training activities will be used: CLASSROOM

- Theoretical problems and lessons (31.5 hours)

- Practical classes with computer (10.5 hours)

NON-CLASSROOM

- Two practical work in actual studies.

LEARNING OBJECTIVES OF THE SUBJECT

The course is aimed to students with electrical profile to complement and extend the knowledge of the techniques of analysis of electrical systems.

The problems caused by non-linear loads from the point of view frequency (harmonics) are presented. Unsymmetrical analyzing behavior with the aid of the symmetrical components, and their use in the determination of short-circuit is introduced. Park transform is applied to the study of electrical machines and temporal three-phase magnitudes.

STUDY LOAD

Туре	Hours	Percentage
Hours large group	27,0	24.00
Self study	72,0	64.00
Hours small group	13,5	12.00

Total learning time: 112.5 h



CONTENTS

SUBJECT 1: HARMONICS

Description:

Non-sinusoidal periodic functions. Summary of Fourier series. Symmetries. Definition of powers; RMS values??; factor of fundamental wave and harmonic factor. Disadvantages of harmonics. Harmonics in three phase systems.

Related competencies :

CEEELEC1. Model, analyse, calculate and design power electronic systems..

Full-or-part-time: 6h

Practical classes: 6h

SUBJECT 2: PASSIVE FILTERS

Description:

Power factor improvement. Possible problems with the presence of harmonics. Passive filters: input functions and frequency behavior.

Related competencies :

CEEELEC1. Model, analyse, calculate and design power electronic systems..

Full-or-part-time: 3h Practical classes: 3h

SUBJECT 3: SYMMETRICAL COMPONENTS

Description:

Sequential loads. Relationships of circulating type on components of electrical networks. Symmetrical components: properties. Sequential impedances of electrical machines.

Related competencies :

CEEELEC1. Model, analyse, calculate and design power electronic systems..

Full-or-part-time: 6h

Practical classes: 6h

SUBJECT 4: THREE-PHASE TRANSFORMER

Description:

The three-phase transformer. Different connections of three-phase transformers. Connection Z. Analysis of unbalances in the standard groups

Related competencies :

CEEELEC1. Model, analyse, calculate and design power electronic systems..

Full-or-part-time: 6h

Practical classes: 6h



SUBJECT 5: SHORT-CIRCUIT CALCULATION

Description:

Analysis of defects in electrical networks. Study of standard short-circuits. Determination of voltages and currents.

Related competencies :

CEEELEC1. Model, analyse, calculate and design power electronic systems..

Full-or-part-time: 4h 30m Practical classes: 4h 30m

SUBJECT 6: PARK TRANSFORMATION

Description:

Park Transformation. Application to electrical machines. Properties. Application to the study of temporal three-phase magnitudes.

Related competencies : CEEELEC1. Model, analyse, calculate and design power electronic systems..

Full-or-part-time: 6h

Practical classes: 6h

GRADING SYSTEM

The final grade, NFINAL, is obtained from the maximum of the following average (rounded to the midpoints) $N1=0.6 \cdot Nef + 0.1 \cdot Npp + 0.1 \cdot Ntc + 0.2 \cdot Nep$ $N2=0.7 \cdot Nef + 0.1 \cdot Ntc + 0.2 \cdot Nep$ where, Nef = grade in the final examination Npp = grade obtained in the partial test Ntc = grade in course work Nep = practice note (simulation)

The retrieval test will replace ($0.6 \cdot \text{Nef} + 0.1 \cdot \text{Npp}$), and the rest of the algorithm will remain unchanged

EXAMINATION RULES.

During the exam, with respect to written material, you can only have an original handwritten A4 sheet with content deemed appropriate.

BIBLIOGRAPHY

Basic:

- Grainger, John J.; Stevenson, William D. Análisis de sistemas de potencia. México: McGraw-Hill, 1996. ISBN 9701009088.