



## IDENTIFYING DATA

### Applied electrotechnics

|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |           |      |            |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|------|------------|
| Subject             | Applied electrotechnics                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |           |      |            |
| Code                | V12G360V01501                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |           |      |            |
| Study programme     | Grado en Ingeniería en Tecnologías Industriales                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |           |      |            |
| Descriptors         | ECTS Credits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Choose    | Year | Quadmester |
|                     | 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Mandatory | 3rd  | 1st        |
| Teaching language   | Spanish                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |           |      |            |
| Department          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |           |      |            |
| Coordinator         | González-Viso Pulido, José Jaime                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |           |      |            |
| Lecturers           | González-Viso Pulido, José Jaime                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |           |      |            |
| E-mail              | jose.jaime.gonzalez-viso.pulido@uvigo.es                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |           |      |            |
| Web                 | <a href="http://moovi.uvigo.gal/">http://moovi.uvigo.gal/</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |           |      |            |
| General description | <p>The objective of Applied Electrotechnic is to complete the training of the students of the Degree of Engineering in Industrial Technologies in what is related with Theory of Circuits and Electric Machines. This subject will provide them specific tools to analyse and evaluate the behaviour of the electric circuits in stable and transitory regime.</p> <p>The subject is conceived to provide the necessary knowledge and competencies to be able to be taught some subjects in the 3rd and 4rd years of the Degree.</p> <p>The students would have studied previously the subjects "Basics of Theory of Circuits and Electric Machines" and "Calculus I and II" because some of the information provided in these subjects will be necessary to follow, without and extra effort, Applied Electrotechnic</p> |           |      |            |

## Training and Learning Results

|      |                                                                                                                                                                        |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Code |                                                                                                                                                                        |
| B3   | CG3 Knowledge in basic and technological subjects that will enable them to learn new methods and theories, and equip them with versatility to adapt to new situations. |
| C22  | CE22 Applied knowledge of electrical engineering                                                                                                                       |
| D1   | CT1 Analysis and synthesis.                                                                                                                                            |
| D2   | CT2 Problems resolution.                                                                                                                                               |
| D6   | CT6 Application of computer science in the field of study.                                                                                                             |
| D10  | CT10 Self learning and work.                                                                                                                                           |
| D14  | CT14 Creativity.                                                                                                                                                       |
| D17  | CT17 Working as a team.                                                                                                                                                |

## Expected results from this subject

| Expected results from this subject                                                                    | Training and Learning Results |     |                                     |
|-------------------------------------------------------------------------------------------------------|-------------------------------|-----|-------------------------------------|
| To understand the behaviour of the electric circuits in case of a change of the working conditions    | B3                            | C22 | D1<br>D2<br>D6<br>D10<br>D14<br>D17 |
| To master the actual techniques for the analysis of 3-phase balanced and unbalanced electric circuits | B3                            | C22 | D1<br>D2<br>D6<br>D10<br>D14<br>D17 |

|                                                                                                                                                              |    |     |                                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----|-------------------------------------|
| To know the measurement and data register techniques in the real electric circuits                                                                           | B3 | C22 | D1<br>D2<br>D6<br>D10<br>D14<br>D17 |
| To acquire analysis skill to evaluate the circuits working under fault conditions. These skills will be applied to the study of the electrical transformers. | B3 | C22 | D1<br>D2<br>D6<br>D10<br>D14<br>D17 |

## Contents

### Topic

|                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| UNIT I: 3-PHASE CIRCUITS, POWER MEASUREMENTS AND REACTIVE POWER COMPENSATION.                                                                                                                                                               | <input type="checkbox"/> Introduction: Generators, loads and 3-phase circuits<br><input type="checkbox"/> Balanced 3-phase circuits. Voltages and currents.<br><input type="checkbox"/> Conversion of 3-phase sources and loads.<br><input type="checkbox"/> Analysis of balanced 3-phase circuits.<br><input type="checkbox"/> Powers in balanced 3-phase circuits. Compensation.<br><input type="checkbox"/> Analysis of unbalanced 3-phase circuits.                                                                                                                                                                                                                                                                                                              |
| This Unit will allow the student to understand how to analyse 3-phase circuits under much balanced or unbalanced conditions                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Initially the unit covers the basic concepts for the analysis of balanced circuits. It continues covering unbalanced circuits, the different methods to measure the electrical powers and the compensation of reactive power.               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| UNIT II: TRANSFORMERS                                                                                                                                                                                                                       | <input type="checkbox"/> Analogies between electric and magnetic circuits.<br><input type="checkbox"/> Introduction to the transformers: constructive aspects.<br><input type="checkbox"/> The ideal transformer.<br><input type="checkbox"/> Operation of the real transformer.<br><input type="checkbox"/> Equivalent circuit of the single-phase transformer real: e.m.f's and voltages.<br><input type="checkbox"/> No-load and in short-circuit tests of the transformer.<br><input type="checkbox"/> Voltage drops, losses and performance of a transformer.<br><input type="checkbox"/> Autotransformers.<br><input type="checkbox"/> 3-phase transformers: Constitution, connection diagrams and tests.<br><input type="checkbox"/> Instrument transformers. |
| This Unit will allow the student to learn about the constructive characteristics of the transformers, to determine his characteristic parameters and to understand the machine main properties and his utilization in the electric systems. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

## Planning

|                       | Class hours | Hours outside the classroom | Total hours |
|-----------------------|-------------|-----------------------------|-------------|
| Laboratory practical  | 9           | 9                           | 18          |
| Practices through ICT | 9           | 9                           | 18          |
| Problem solving       | 9           | 18                          | 27          |
| Lecturing             | 20          | 60                          | 80          |
| Essay questions exam  | 7           | 0                           | 7           |

\*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

## Methodologies

|                       | Description                                                                                             |
|-----------------------|---------------------------------------------------------------------------------------------------------|
| Laboratory practical  | Experimental solving of proposed lab tests, realization of measurements and presentation of results.    |
| Practices through ICT | <input type="checkbox"/> Simulación by means of computer programs of 3-phase circuits and transformers. |
| Problem solving       | <input type="checkbox"/> Students solving of proposed exercises. Personal guidance if required          |
| Lecturing             | The usual master lessons                                                                                |

## Personalized assistance

| Methodologies        | Description                                                                                                                                                                                                                |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lecturing            | The doubts and questions that can arise during the classes or personal assignments of the students will be solved either in situ or during the tuition hours. The tuition personal attention should be required by e-mail. |
| Laboratory practical | The doubts and questions that can arise during the classes or personal assignments of the students will be solved either in situ or during the tuition hours. The tuition personal attention should be required by e-mail. |

|                       |                                                                                                                                                                                                                            |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Practices through ICT | The doubts and questions that can arise during the classes or personal assignments of the students will be solved either in situ or during the tuition hours. The tuition personal attention should be required by e-mail. |
| Problem solving       | The doubts and questions that can arise during the classes or personal assignments of the students will be solved either in situ or during the tuition hours. The tuition personal attention should be required by e-mail. |

## Assessment

| Description          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Qualification | Training and Learning Results              |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------------------------------|
| Essay questions exam | Continuous assessment (100%): At the end of each subject the student will perform a test that will be scored from 0 to 10 points. The passing grade is 5. The test will assess theoretical issues and practical exercises. In each test the student can reach 50% of the final grade. The passed partial tests are released from the corresponding part in the final exam. For students who pass all tests, the final grade will be the weighted average of the marks of the partial tests. Students who fail or fail to submit any or all partial tests, will take a final exam in the official exam that will be graded from 0 to 10 points. To pass the subject it is necessary to achieve a minimum grade of 3 points in each unit. The students approved by partial tests can modify the note and also present the final test. The examination will indicate the dates and places of publication of grades and revisions. | 100           | B3 C22 D1<br>D2<br>D6<br>D10<br>D14<br>D17 |

## Other comments on the Evaluation

The student only has to take the failed partial in the July exam. The July final mark will be calculated equally as for the first final mark.

## Sources of information

### Basic Bibliography

Parra V.M., Ortega J., Pastor A. y Pérez-Coyto A, **Teoría de Circuitos**, UNED,  
González E., Garrido C. y Cidrás J, **Ejercicios resueltos de circuitos eléctricos**, Tórculo Edicións,  
Fraile Mora, Jesús, **Máquinas Eléctricas**, McGraw-Hill,  
Jesús Fraile Mora y Jesús Fraile Ardanuy, **Problemas de Máquinas Eléctricas**, McGraw-Hill/InterAmericana de España,

### Complementary Bibliography

## Recommendations

### Subjects that continue the syllabus

Electrical machines/V12G360V01605

### Subjects that it is recommended to have taken before

Physics: Physics 2/V12G360V01202  
Mathematics: Calculus 2 and differential equations/V12G360V01204  
Basics of circuit analysis and electrical machines/V12G360V01302

## Other comments

Requirements: To enrol in this subject is necessary to have surpassed or well be enrolled of all the subjects of the inferior courses to the course in the that is summoned this subject