Electrical power engineering fundamentals

Academic Year: (2019 / 2020) **Review date: 20-11-2020**

Department assigned to the subject: Electrical Engineering Department

Coordinating teacher: CHINCHILLA SANCHEZ, MONICA

Type: Compulsory ECTS Credits : 6.0

Year : 2 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

All first-year subjects. Among them, Calculus I, Calculus II, Lineal Algebra and Physics II are of utmost importance.

OBJECTIVES

Learning results.
After the student has passed this subject, he/she will be able to:
1. A systematic understanding of the key aspects and concepts of electrical engineering;
2. Awareness of the wider multidisciplinary context of engineering.
3. The ability to apply their knowledge and understanding to identify, formulate and solve electrical engineering problems using established methods;
4. The ability to design and conduct appropriate experiments, interpret the data and draw conclusions;
5. Workshop and laboratory skills.
6. The ability to combine theory and practice to solve electrical engineering problems.

DESCRIPTION OF CONTENTS: PROGRAMME

* Introduction to the Electric Power Engineering
* Ideal- and real elements of circuits: resistance, inductance, capacitance, coupled inductances, voltage- and current sources.
* Kirchhoff laws.
* Grouping of elements. Voltage and current divider.
* Mesh and nodal analysis of linear circuits
* Superposition principle. Thevenin's and Norton's theorems.
* Symbolic computation by means of complex phasors.
* Analysis of a.c. circuits
* Power factor compensation.
* Balanced three-phase circuits

LEARNING ACTIVITIES AND METHODOLOGY

THEORY - AGGREGATE GROUPS

Theoretical concepts will be explained during lectures, based on slide presentations available on Aula Global. Additional multimedia material could be provided during the course. It is highly recommendable to read/hear/view the material before the class.

PRACTICE - SMALL GROUPS

The teacher will solve problems using the knowledge already presented in the previous lectures and propose additional exercises to the students to practice during the class.

LABORATORY SESSIONS
- Attendance is optional, but if you want to attend you need to inscribe in the group lists.
- There are three lab sessions:
  - ¿ Basic concepts and DC systems
  - ¿ AC systems
  - ¿ Three-phase AC systems

- Safety in the lab is a major issue. No one should turn on any devices without the supervision of the laboratory teacher. Personal and partner¿s safety are the most important safety issues. Equipment safety is also important. Safety rules and indications from the teacher must always be followed. Breaking this rule may cause expulsion from the course.
- There is a lab report for every session. In this report, there is a part to be completed before the lab session. Completion of this part is mandatory to get into the lab. All reports will be checked and validated. Those who fail in this part won¿t be allowed in the lab.
- The exam consists on simple exercises about different aspects learnt during the lab sessions, i. e. how to connect a voltmeter/ammeter, properly analyzing a waveform in an oscilloscope, delta/star connection of three-phase loads and so on.
- The grade of the laboratory will be the grade of the exam. The lab reports will not be graded.

REPEAT STUDENTS

- All Students, even those repeating the course, must take the laboratory test.

GENERAL INFORMATION

- Theory: Belén García, 1.3D10, 91 624 9949, bgarciad@ing.uc3m.es
- Laboratory: Ashkan Nami, anami@ing.uc3m.es
- Tuorial sessions: check professor¿s timetable on Aula Global. The tutorial session must be previously requested via e-mail. Tutorial sessions will only be attended within office hours.

ASSESSMENT SYSTEM

Student assessment can be done by any of two alternative methods: continuous evaluation+final exam or final exam only.

CONTINUOUS EVALUATION+FINAL EXAM:

- Continuous evaluation qualification will amount the 45% of the total. During the course several partial exams will be scheduled. The continuous evaluation grade will be 90 % partial exams + 10% lab grade.

- The final exam (55% of the total grade), will consist in solving 3 - 4 numerical problems of circuit analysis, covering the whole content of the course.

- Students must have a minimum grade of 5 in the lab exam to pass the course in the ordinary call.

The teacher can exempt any student from the final examination as long as they have passed all the partial exams with a minimum grade of 2,5 points in every of them, and have an average continuous evaluation grade equal/greater than 5 points (not including the laboratory grade). The students accomplishing these conditions and wanting to improve their grades can do the final exam considering the grade will be weighted with the continuous evaluation one.

The same criteria as above will apply in the extraordinary call, excluding the mention to the possibility of direct passing by course average grades.

EXTRAORDINARY CALL
Students will take an exam consisting in solving 3 - 4 numerical problems of circuit analysis, covering the whole content of the course (this amounts to 90% of the total), plus a test on the activities carried out during the lab sessions (remaining 10%).

To calculate the total record for the extraordinary call the most favorable of these formulas will be applied to each student:
- 55 % Exam+ 45 % Continuous evaluation
- 100 % Final exam

- 100 % of the total record will come from a final exam consisting in solving 3 - 4 numerical problems of circuit analysis, covering the whole content of the course (this amounts to 90% of the total), plus a short test on the activities carried out during the lab sessions (remaining 10%).

% end-of-term-examination:	55
% of continuous assessment (assigments, laboratory, practicals…):	45

BASIC BIBLIOGRAPHY

- A. Bruce Carlson Teoria de Circuitos, Thomson, 2002
- James W. Nilson Electric Circuits, Pearson.

ADDITIONAL BIBLIOGRAPHY

- Guillermo Robles Problemas resueltos de Fundamentos de Ingeniería Eléctrica, Paraninfo.
- Jesús Fraile Mora Circuitos eléctricos, Pearson.
- Jesús Fraile Mora Problemas de circuitos eléctricos, Pearson.
- Julio Usaola y A. Moreno Circuitos eléctricos. Problemas y ejercicios resueltos, Prentice Hall.