# COURSE GUIDE
# 2019-2020

Dean, Prof. Daniela Tărniceriu

## 1. Program info

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| 1.1 Higher education institution | "Gheorghe Asachi" Technical University of Iaşi |
| 1.2 Faculty / Department | Electronics, Telecommunications and Information Technology |
| 1.3 Department | Telecommunications and Information Technologies |
| 1.4 Field | Electronic Engineering, Telecommunications and Information Technology |
| 1.5 Study level | Bachelor's Degree Studies |
| 1.6 Study program / Qualification | Telecommunications Systems and Technologies |

## 2. Course info

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|---|---|---|---|---|---|---|---|
| 2.1 Course name: **Fundamentals of Electrical Engineering II** | | | | | | Code: EDID134 | |
| 2.2 Course organizer (lecturer) | | Lecturer Cristina Vatavu | | | | | |
| 2.3 Teaching assistants | | Lecturer Cristina Vatavu | | | | | |
| 2.4 Year of study | 1 | 2.5 Semester | 2 | 2.6 Assessement | E | 2.7 Type of subject | DID |

## 3. Estimated total time (hours per semester for teaching activities)

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|---|---|---|---|---|---|
| 3.1 Number of hours per week | 2 | 3.2 lecture | 1 | 3.3 seminar | 1 |
| 3.4 Total number of hours in curricula | 28 | 3.5 lecture | 28 | 3.6 seminar | 14 |

| Time distribution | hours |
|---|---|
| Textbook, course support, references and course notes study | 14 |
| Library, electronic platforms and on site documentation | 3 |
| Seminar/laboratory preparation, homework, reports, portfolios and essays | 7 |
| Tutoring | 4 |
| Assessment | 2 |
| Other activities | - |

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| **3.7 Total individual study hours** | 44 |
| **3.9 Total hours per semester** | 72 |
| **3. 10 Number of credit points** | 3 |

## 4. Prerequisites (where applicable)

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|---|---|
| 4.1 curricula type | • No |
| 4.2 competence type | • cognitive competencies on mathematics |

## 5. Infrastructure (where applicable)

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| 5.1. for lectures | • Conference room with video projector, projection shield and blackboard.<br>• Internet access, Moodle accounts for students |
| 5.2. for seminars | • No |

## 6. Specific competences

| | | | ECTS[i]: 3 | ECTS Distribution[ii] |
|---|---|---|---|---|
| Professional competences | CP1 | Acquiring representation of signals in the frequency domain | | 0.4 |
| | CP2 | Evaluation of circuit parameters in frequency domain | | 0.4 |
| | CP3 | Determination of a signal applying different analysis methods in frequency domain | | 0.4 |
| | CP4 | Powers evaluation | | 0.4 |
| | CP5 | Evaluation of magnetically coupled circuits | | 0.4 |
| | CP6 | Evaluation of circuits with ideal transformers | | 0.4 |
| | CPS | | | |
| Interdisciplinary competences | CT1 | Efficient communication | | 0.2 |
| | CT2 | Creativity developing | | 0.2 |
| | CTS | Process-orientated technical skills developing | | 0.2 |

## 7. Course targets (as resulting from 6. Specific competences table)

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| 7.1 Course main target | • To develop problem solving skills and understanding of circuit theory through the application of techniques and principles of electrical circuit analysis to common circuit problems. |
| 7.2 Course specific targets | • To develop an understanding of the fundamental laws and elements of electric circuits.<br>• To learn the energy properties of electric elements and the techniques to measure voltage and current.<br>• To understand waveforms, signals, and transient and steady-state responses of RLC circuits.<br>• To develop the ability to apply circuit analysis to AC circuits.<br>• To understand advanced mathematical methods such as Laplace and Fourier transforms along with linear algebra and differential equations techniques for solving circuits problems. |

## 8. Contents

| 8. 1 Lectures | Teaching methods | Notes |
|---|---|---|
| 1. AC circuits with steady-state sinusoidal excitation.<br>Phasors and frequency domain circuit parameters. Solution of simple circuits by combining impedances in series and parallel. | Oral presentation of theory and numerical examples, Solving exercises, case studies. | 4 hours |
| 2. AC steady-state circuits analysis.<br>Kirchhoff's Laws. Nodal analysis. General theorems. | Oral presentation of theory and numerical examples, Solving exercises, case studies. | 6 hours |
| 3. AC steady-state power<br>AC power absorbed by a resistor, inductor and capacitor. Relationships between power, reactive power and VA, power factor, principle of conservation of power and reactive power, reactive power absorbed by capacitors and inductors, power factor correction, complex power in terms of phasor voltages and currents.<br>Maximum real power transfer theorem. | Oral presentation of theory and numerical examples, Solving exercises, case studies. | 6 hours |
| 4. Magnetically coupled circuits.<br>Ideal transformer.<br>Analysis with Kirchhoff's Laws.<br>Determination of frequency domain equivalent parameters. | Oral presentation of theory and numerical examples, Solving exercises, case studies. | 6 hours |
| 5. Transient response in DC circuits.<br>Energy storage elements: inductance and capacitance. Transients in circuits with a first-order response by analytic solution of a differential equation, exponential rise and decay, time constant in R-C and R-L circuits; initial conditions, effect of initial condition on response, energy storage in capacitors and inductors. | Oral presentation of theory and numerical examples, Solving exercises, case studies. | 6 hours |
| **8. 2 Seminar** | **Teaching methods** | **Notes** |
| 1. Analysis in frequency domain of circuits without couplings. Kirchhoff Laws<br>2. Current and voltage dividers<br>3. Nodal voltages method<br>4. Power analysis of linear circuits in sinusoidal steady-state<br>5. Power factor. Maximum Active Power Transfer Theorem<br>6. Analysis of magnetically coupled circuits in sinusoidal steady-state<br>7. Analysis of circuits with ideal transformers | Observation, analog correlation, algorithmic formulation, discovery | 2 hours<br>2 hours<br>2 hours<br>2 hours<br>2 hours<br>2 hours<br>2 hours |
| References:<br>1. E-course on http://edu.etti.tuiasi.ro/course/view.php?id=129<br>2. https://www.academia.edu/35781350/Basic_Engineering_Circuit_Analysis_by_J.David_Irwin_R.Mark_Nelms_10th_Edition.pdf<br>3. Iustina Zaharia , Bazele electrotehnicii. Teoria circuitelor electrice , editia a IIa, Editura Tehnopress, 2013 | | |

**9. Course contents corroboration with the expectations of the epistemic community representatives, professional associations and relevant employers in the field of the program**

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| **The objectives of the course and the used teaching methods have goal to develop in students the idea of competence, the spirit of competitiveness, creativity, imagination, technical skills, seriousness and responsibility.** |

**10. Assessment**

| **Activity type** | **10.1 Assessment criteria** | **10.2 Assessment methods** | **10.3 Percentage of final grade** |
|---|---|---|---|
| 10.4 Lectures | Theoretical knowledge acquired (quantity, correctness, accuracy) | Written examination, three questions test | 30 % (minimum grade 5) |
| | Problem solving capabilities | Written examination, two problems | 60 % (minimum grade 5) |
| 10.5a Seminar | Frequency / relevance of interventions or responses | - evidence of interventions | 10% (minimum grade 5) |
| 10.6 Minimum performance standard | | | |
| Proper application of Kirchhoff's Laws. | | | |

Completion date:
09/10/2019

Course organizer signature,
Lecturer Cristina Vatavu

Teaching assistant signature,
Lecturer Cristina Vatavu

Department approval date,
10/10/2019

Department director signature,
Assoc. Prof. Luminița Scripcariu