

## Faculty of Applied Sciences



### ELEC2370 Measurements and electrical circuits

[45h+30h exercises] 7 credits

This course is taught in the 1st semester

**Teacher(s):** Christian Eugène, Francis Labrique, Charles Trullemans  
**Language:** French  
**Level:** Second cycle

#### Aims

At the end of this course, the students will be able

- to master the circuit theory with an aim oriented towards the conception and the analysis of systems in electronics, telecommunications and electrodynamics,
- to measure electrical quantities (to obtain significant results and to interpret them correctly),
- to use measurements in order to obtain a sound physical perception of circuits models and of their limits.

The "circuit" part goes deeper in and completes the matters taught in the first cycle with the aim to give the students the knowledges needed to effectively start the technical training in electronics, telecommunications and electrodynamics.

The "measurement" part aims to learn how to measure correctly, i.e. to choose adequate methods and instruments, and to use them advisedly. The aim is also to allow the students to perceive how important in the applied sciences is the experimental validation.

#### Main themes

Identical to the contents of the course

#### Content and teaching methods

##### Part "Circuits"

1. Basic concepts (constitutive elements, Kirchhoff laws, direct resolution of simple circuits)
2. Linear DC circuits
3. Linear steady-state sinusoidal circuits (phasor method). Frequency response of linear circuits
4. Transient response of linear circuits (operational impedances method)
5. Quadripodes
6. Study of circuits by simulation (initiation to SPICE)

##### Part "Measures"

Only low frequency (max. 1 MHz) measurements in industrial (namely in the energetic 50 Hz sector) and laboratory applications are tackled.

1. Measurement errors (accuracy and sensitivity. Systematic and random errors and the combination of them)
2. Measurement principles (terminology, international system of units, instrumental characteristics)
3. Analog signal processing
4. Use of analog and digital scope
5. Measure of active quantities : voltage, current, power in DC and AC
6. Null methods (potentiometer, impedance bridges)
7. Dielectric measurements; magnetic measurements (H, B, flux, B-H characteristics of a material)

**Other information (prerequisite, evaluation (assessment methods), course materials recommended readings, ...)**

## Prerequisites :

This course is close connected to the project ELEC101 (Project in Electricity 1)

## Assessment method :

written and/or oral exam during the sessions

## Bibliography :

Pedagogical support : teacher's own syllabus

**Other credits in programs**

<b>ELEC21</b>	Première année du programme conduisant au grade d'ingénieur (7 credits) civil électricien	Mandatory
<b>ELME21/E</b>	Première année du programme conduisant au grade d'ingénieur (7 credits) civil électro-mécanicien (énergie)	Mandatory
<b>ELME21/M</b>	Première année du programme conduisant au grade d'ingénieur (7 credits) civil électro-mécanicien (mécatronique)	Mandatory
<b>MAP21</b>	Première année du programme conduisant au grade d'ingénieur (7 credits) civil en mathématiques appliquées	