Course Syllabus

1. **Course number and name:** 020SPHNI1 Physical Signals
2. **Credits and contact hours:** 6 ECTS credits, 3x1:15 course hours
3. **Instructor's or course coordinator's name:** Rémi Z. DAOU
4. **Text book:** *Physique tout-en-un MPSI, Salamito, J'intègre-Dunod, 2013*
5. **Specific course information**
    a. **catalog description:** The course is concerned with a wide range of concepts already introduced at high school: periodic signals, spectrums, electrical energy, Ohm's law, Joule's law, lenses, wave length, light spectrum, numerical signal, travelling wave, diffraction, interferences, Doppler effect, Newton's law, mechanical energy, harmonic oscillator. A big effort is made to assure a smooth transition toward a more quantitative physics than the one seen at high school.
    b. **prerequisites or co-requisites:** None
    c. **Required/Elective/Selected Elective:** Required
6. **Specific goals for the course**
    a. **Specific outcomes of instruction:**
        - Understand the role of a differential equation in the study of temporal evolution of a physical system
        - Analyze the representation of solutions in a phase portrait
        - Relate linearity and superposition
        - Identify and interpret the analytical expression of a propagating signal
        - Relate boundary conditions and quantification
        - Relate boundary conditions and decomposition in stationary waves
        - Identify similitudes in the behavior of analog systems by writing an equation in reduced non-dimensional variables and parameters
        - Support proofs and calculations by clear and precise graphics
    b. **KPIs addressed by the course:**

KPI	a1	a2	b1	b2	b3
Covered	x		x		
Assessed	x				
Give Feedback	x				

7. **Brief list of topics to be covered and approximate number of lectures:**
    1. Harmonic oscillator (3 lectures)
    2. Linear electric circuits in a quasi-stationary regime (5 lectures)
    3. Linear electric circuits of first ordre (4 lectures)
    4. Damped oscillator (3 lectures)
    5. Sine signal and complexe notation (4 lectures)
    6. Damped electric oscillator and resonance (4 lectures)
    7. Linear electric filters (5 lectures)
    8. Signal propagation (3 lectures)
    9. Waves superposition and interference (3 lectures)
    10. Light waves (3 lectures)
    11. Geometrical optics (5 lectures)