Badji Mokhtar Annaba University **2025/2026**
Faculty of Technology
Computer Science Department **Module : *General Electricity***
1st year LMD

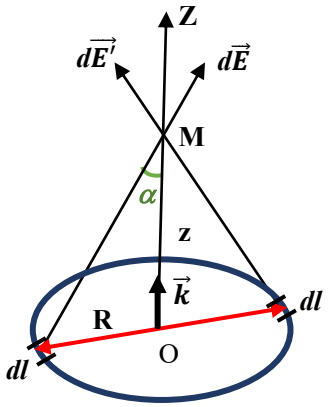
SERIES 2 (Part 2)

(Continuous Distribution of Charges, Gauss's Theorem, Conductors)

Exercise 1 :

Consider a circular wire of radius R, uniformly charged with a charge density $\lambda > 0$.

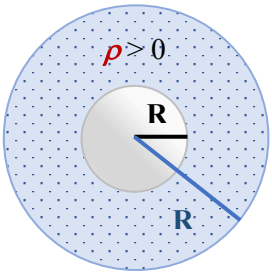
1. Determine the electric field $\vec{E}(M)$ created at a point **M** on its axis, located at a distance z from center O.
2. Give the expression of the electric potential V(M).
3. Deduce $\vec{E}(M)$.



Exercise 2 :

Let two concentric spheres with center O of radii $\mathbf{R_1}$ and $\mathbf{R_2}$ respectively such that $\mathbf{R_1} < \mathbf{R_2}$.

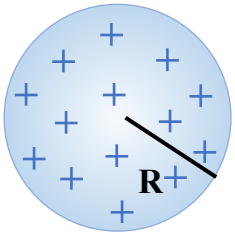
1. Using Gauss's theorem, calculate the electrostatic field at any point in space for a volume charge distribution ($\rho > 0$) uniformly distributed between these two spheres.
2. Deduce the electric potential at any point in space.



Exercise 3 :

A conducting sphere of radius **R** carries a charge **Q** > 0. Calculate:

1. Its potential **V**.
2. Its capacitance **C**.
3. Its surface density σ.



Exercise 4 :

Two conducting spheres, of radii $\mathbf{R_1}$ and $\mathbf{R_2}$ carrying charges $\mathbf{Q_1}$ and $\mathbf{Q_2}$ respectively, are placed at a very large distance compared to the radii.

1. Calculate the potentials $\mathbf{V_1}$ and $\mathbf{V_2}$ of the two spheres.
2. Connecting the two spheres with a conductive wire of negligible resistance, calculate the charges $\mathbf{Q_1'}$ and $\mathbf{Q_2'}$ as well as the potentials $\mathbf{V_1'}$ and $\mathbf{V_2'}$.
3. Calculate the capacitance of the single conductor formed.