**Universidad Nacional de Río Cuarto**
**Faculty of Engineering**

Curse: **Differential Equations**

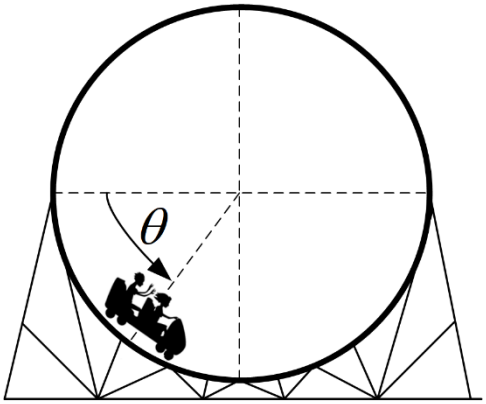
Date: **Second semester 2022**

Careers:

**Mechanical Engineering**
**Chemical Engineering**
**Electrical Engineering**
**Telecommunications Engineering**
**Renewable Energy Engineering**

# Stability Analysis of Nonlinear Systems

A car slides down the curve shown in the figure. It corresponds to a circle of 6 m radius.




Considering the car as a point mass that moves on the curve:

a) Find a dynamic model for the car as a function of $\theta$.
b) Find the critical points for $0 \leq \theta < 2\pi$.
c) Classify the critical points considering that there is no damping.
d) Classify critical points for different damping levels.
e) Plot each case in the phase plane.