Course Syllabus

1. **Course number and name :** 020MC1NI1 Mechanics 1
2. **Credits and contact hours :** 6 ECTS credits, 3x1:15 course hours
3. **Instructor's or course coordinator's name :** Sami YOUSSEF
4. **Textbook:** *Physique tout-en-un MPSI, Salamito, J'intègre-Dunod, 2013*

5. **Specific course information**
   a. **catalog description :**
   Coordinate systems, Kinematics of single particles, Concept of force, Principle of inertia, Newton's second law, Action-reaction law, Free fall, Dry and fluid friction, Power and work, Work-energy theorem, Potential energy, Equilibrium and stability in the presence of external force fields, Mechanical energy, Motion in a conservation force fields, Lorentz force, Motion of charged particles in electric and magnetic fields, Central fields and the motions of planets and satellites.
   b. **prerequisites :** None
   c. **Required/Elective/Selected Elective :** Required

6. **Specific goals for the course**
   a. **specific outcomes of instruction**
   - To be able to define a system and the net force acting on a particle.
   - To be able to choose a frame of reference and an appropriate coordinate system.
   - To be able to demonstrate a knowledge of Newton's laws of motion.
   - To be able to set up and solve the equations of motion.
   - To be able to demonstrate an ability to use conservation laws in the solution of physical problems.
   - To be able to demonstrate a knowledge of central-force motion.

   b. **KPIs addressed by the course:**

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

7. **Topics and approximate lecture hours :**

- Course introduction (1 Lecture)
- Cartesian, cylindrical and spherical coordinate systems, Polar coordinate system, Kinematics of single particles, Circular and non-uniform acceleration motions (7 Lectures)
- Newton's Laws of Motion, Free fall, Dry and fluid friction, simple gravity pendulum and small angle approximation (8 Lectures)
- Power and work, Work-energy theorem, Potential energy, Equilibrium and stability, conservative and non-conservative fields, Mechanical energy, Bound and free sates, phase space (8 Lectures)
- Electrical and magnetism phenomena, Lorentz force, Electric potential energy, Motion of charged particles in electric and magnetic fields (8 Lectures)
- Central forces and effective potential energy, Conservation of angular momentum, Polar equation of conic section, Eccentricity vector, Planetary and satellite motions, Kepler's three laws, Escape velocity (10 Lectures)