Mechatronics and Intelligent Machines

1. **Course number and name:** 020MMIES5 Mechatronics and Intelligent Machines

2. **Credits and contact hours:** 4 ECTS credits, 2x1:15 contact hours per week

3. **Name(s) of instructor(s) or course coordinator(s):** TBD (To Be Determined)

4. **Instructional Materials:** PowerPoint slides.

   Textbook/Reference:
   - Introduction to Mechatronics and Measurement Systems, 6th edition, David G. Alciatore and Michael B. Histand, McGraw-Hill Education, 2018.

5. **Specific course information**
   a. **Catalog description:**
   This course offers a comprehensive exploration of mechatronics and intelligent machines, emphasizing sensors, actuators, system modeling, computer simulation, information processing, perception, cognition, planning, control, and system design. Students will gain practical knowledge through hands-on projects and applications.

   b. **Prerequisite:** Linear Control (020AULES2).

   c. **Selected Elective** for ME students.

6. **Educational objectives for the course**
   a. **Specific outcomes of instruction:**
   - Apply sensor technologies: choose and integrate appropriate sensors, understand sensor noise, and implement sensor fusion techniques in mechatronic systems.
   - Implement actuators effectively: demonstrate the ability to select, integrate, and control actuators for desired system responses in mechatronic applications.
   - Create and analyze system models: develop mathematical models, conduct automated computer simulations, and analyze system behavior.
   - Utilize information processing and perception: demonstrate a deep understanding of information processing, perception technologies, and their application in intelligent machines.
   - Design and implement planning and control strategies: design planning algorithms, develop control systems, and apply intelligent control techniques for mechatronic systems.
   - Architect, design, and develop mechatronic systems: design system architectures, apply design methodologies, manage development processes, and successfully integrate and test mechatronic systems.

b. PI addressed by the course:

PI	1.1	1.2	1.3	2.1	2.2	2.3
Covered	x	x	x	x	x	x
Assessed						

7. Brief list of topics to be covered

- **Chapter 1: Introduction to Mechatronics:** Definition and scope – Historical development – Importance in modern engineering – Overview of mechatronics components. (4 Lectures).
- **Chapter 2: Sensors and Actuators:** Types of sensors and actuators – Sensor noise and sensor fusion – Signal conditioning – Actuator technologies. (4 Lectures).
- **Chapter 3: System Models and Automated Computer Simulation:** Introduction to system modeling – Mathematical modeling techniques – Computer simulation tools – Simulation of mechatronic systems. (4 Lectures).
- **Chapter 4: Information, Perception, and Cognition:** Information processing in mechatronic systems – Perception and sensing technologies – Cognitive aspects in intelligent machines – Human-machine interaction. (4 Lectures).
- **Chapter 5: Planning and Control:** Planning algorithms – Control system design – Feedback control – Intelligent control techniques. (4 Lectures).
- **Chapter 6: Architectures, Design, and Development:** Mechatronic system architectures - Design methodologies - Development processes - Integration and testing. (4 Lectures).