

Course Title	<b>Sensors &amp; Actuators for Smart Systems</b>				
Course Code	<b>WSS532</b>				
Course Type	Specialisation (Elective)				
Level	Master (2nd Cycle)				
Year / Semester	1/2 (Spring)				
Teacher's Name	Dr. Konstantinos Tatas				
ECTS	10	Lectures/week	3	Laboratories/week	0
Course Purpose and Objectives	<p>This module aims to provide you with the knowledge of the essential tools and techniques to:</p> <ul style="list-style-type: none"> <li>• Model sensors using transfer functions</li> <li>• Select and use appropriate sensors and actuators in your systems</li> <li>• Compensate for systematic and random sensor errors</li> <li>• Appropriately connect sensors and actuators to a digital system</li> <li>• Write programs for reading sensors and controlling actuators</li> </ul>				
Learning Outcomes	<ul style="list-style-type: none"> <li>• Illustrate the role of sensors and actuators in embedded systems.</li> <li>• Describe sensor and actuator technologies and their limitations.</li> <li>• Design and simulate simple sensors.</li> <li>• Compensate for systematic and random sensor errors.</li> <li>• Design control circuits and programs for actuators.</li> </ul>				
Prerequisites	None	Required	None		
Course Content	<ol style="list-style-type: none"> <li>1. <b>Transducers, sensors and actuators:</b> Types of transducers, types of sensors and actuators</li> <li>2. <b>Sensor Characteristics:</b> Transfer functions, accuracy, precision, sensitivity, hysteresis, systematic and random errors, range and repeatability</li> <li>3. <b>Sensor and Actuator Design and Modelling:</b> Physical principles of sensing: Charge, Capacitance, Induction, Resistance, Piezoelectric effect, hall effect</li> <li>4. <b>Interfacing with Sensors:</b> Amplifiers, Analog to Digital conversion, ADC characteristics</li> <li>5. <b>Actuator control:</b> DC motor, servo motor and stepper motor control</li> <li>6. <b>Sensor and Actuator applications:</b> Sensor and actuator applications in e-health, robotics, wireless sensor networks, IoT etc.</li> </ol>				
Teaching Methodology	The course is structured in units that are conducted with the help of material available online described in the module study guide. The primary resources are presentations that introduce the course material together with practical examples and exercises to				

	<p>enhance the material learning process based on the textbook(s).</p> <p>Other resources include research papers and online tutorials in presentation or video format.</p>
Bibliography	<ul style="list-style-type: none"> <li>• Jacob Fraden, "Handbook of Modern Sensors: Physics, Designs and Applications", Springer, 2010</li> <li>• Clarence W. de Silva, Sensors and Actuators: Engineering System Instrumentation, Second Edition, CRC Press, 2015</li> <li>• An extensive reading list of relevant research papers</li> </ul>
Assessment	<ul style="list-style-type: none"> <li>• Assignment                    30%</li> <li>• Participation activities:30%</li> <li>• Final exam:                    40%</li> </ul>
Language	English