# OVERVIEW OF THE COURSE: AUTONOMOUS SENSORS
## Module of: Robotics and Autonomous sensors

| **Study programme name**<br>Precision Livestock Farming | | Course | | X | Master degree | A.A. | 2019/20 |
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**Teacher: Leopoldo Angrisani**  ☎ 0817683170  email: leopoldo.angrisani@unina.it

SSD  ING-INF/07    CFU  5    Year  I    Term  II

**Prerequisites:**

## EXPECTED LEARNING RESULTS/RISULTATI DI APPRENDIMENTO ATTESI

| **Knowledge and understanding skills/Conoscenza e capacità di comprensione** |
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| Providing the theoretical and practical fundamentals of measuring physical quantities. Explaining the principles of operation of the sensors, the main components of their architecture in charge of data processing and transmission, operation in network, interfacing and connectivity, powering of the active parts. |
| **Applied knowledge and understanding skills/Conoscenza e capacità di comprensione applicate** |
| Putting the student in a position to correctly interpret and use the technical specifications and metrological characteristics of the sensors. |
| **Any further learning outcomes expected in relation to/Eventuali ulteriori risultati di apprendimento attesi, relativamente a** |
| • **Autonomy of judgment/Autonomia di giudizio:** |
| • **Communication skills/Abilità comunicative:** |
| • **Learning skills/Capacità di apprendimento:** |

## COURSE MAIN CONTENTS/PROGRAMMA

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| Theoretical foundations of measurement. Measurement units. Calibration. Measurement uncertainty. The propagation of uncertainty in indirect measurements. Conditioning of physical quantities. Temperature, optical, mechanical, acoustic and chemical sensors. Metrological characteristics of sensors. A/D conversion and digital processing of measurement data. Interfacing and measurement data transmission. Issues related to the power supply of autonomous sensors: wireless power transmission and energy harvesting approaches. Sensor networks. Smart sensors in the Internet of Things paradigm. |

## COURSE MATERIAL

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| • Nathan Ida, 'Sensors, Actuators, and their Interfaces (A multidisciplinary introduction)' SciTech Publishing USA<br>• Lecture notes provided during the course. |

## TARGET AND MODALITY AIMED TO ASSESS THE LEARNING RESULTS

**a) Learning results to be verified/Risultati di apprendimento che si intende verificare:**
Theoretical and practical fundamentals of measuring physical quantities. Principles of operation of main sensors along with chief components of their architecture.

**b) Assessment method/Modalità di esame:**

| Examination includes | Written test and oral | | Written test | | Oral | X |
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| Project report discussion | | | | | | |
| Other procedures (specify) | Laboratory exercise | | | | | |

| Written test - questions ask for (*) | Multiple answers | | Free answers | | Numerical exercises | x |
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