

## Information on the Course called PERVASIVE SYSTEMS (6 CFU – English Language)

**Main Graduate Program: M.Sc. in Management Engineering (MGER)**

**Adopted from: M.Sc. in Electronics (MELR) and Telecommunications (MCOR)**

**Academic Year 2014-15**

**Teacher: Prof. Massimo Panella**

### **Programme**

References of hardware and software architectures, parallel computation on “fine grain” systems.

References of networking systems (WSN, BAN, PAN).

Sensors and actuators: low power and low energy issues; energy harvesting and self-powering; reliability (fault tolerance, fault detection, self-organization).

Smart devices for pervasive computing: data loggers and embedded systems; smart sensors on mobile devices (smartphones, Tablet PCs, etc.); wearable computers.

Technologies and applications for identification and tracking: references on localization techniques; RFID sensors on pervasive systems; context-aware computing.

Distributed computational intelligence: neural networks, fuzzy logic, evolutionary algorithms, swarm intelligence; middleware services and agents; grid computing and cloud computing.

Trust, security and privacy issues.

Practical achievements of “Apps” for pervasive computing: adaptive multichannel communication, augmented reality; smart cameras, depth sensors and human-computer interaction (HCI); smart grids; intelligent transportation systems; logistics, safety and security; smart home and telemedicine; integrated measures using data loggers, smartphones and Tablet PCs.

### **References**

J. Burkhardt, et al., *Pervasive Computing*, Addison Wesley, 2002.

U. Hansmann, et al., *Pervasive Computing*, Springer Professional Computing, 2nd ed., 2003.

S. Loke, *Context-Aware Pervasive Systems: Architectures for a New Breed of Applications*, Auerbach Publications, 2006.

A. Greenfield, *Everyware: The Dawning Age of Ubiquitous Computing*, Peachpit Press., 2006.

Notes and handouts provided by the teacher.

### **Benchmarks**

The course will provide fundamentals about theoretical, technical and practical issues in the design and implementation of current and future pervasive systems, focusing the attention on innovative technologies and the need to make the systems autonomous from the point of view of energy, safety and security. Key concepts will be investigated in a wide sense, by focusing on the most recognized issues in the field of pervasive systems. Consequently, the student’s training should be accomplished for what concerning wireless technologies, sensor networks as well as intelligent and distributed signal processing, as of particular interest for scientific and industrial application (logistics, transport, safety, security, telemedicine,

cultural heritage, etc.). Finally, the student should gain capabilities on the analysis and solution of problems pertaining to the design, implementation and operation of pervasive systems, with particular regard to wireless technologies, sensor networks and ICT applications.