Introduction to Energy Autonomous Wireless Systems (D. Briand/2h)
- Description of course organization and content
- Introduction to EAWS, building blocks, state of the art, applications, case studies

Energy sources and storage (D. Briand/5h)
Working principles, technologies and comparison (efficiency, power density, potential applications) of energy sources and storage:
- Batteries, supercapacitors, micro-fuel cells
- Energy harvesters: solar, radiation, mechanical, thermal, chemical
RF, inductive and acoustic powering and backscattering wireless communication (C. Dehollain/6h)
- Near field, far field and ultrasonic remote powering
- AC to DC converter (rectifier) and voltage regulator dedicated to magnetic, electro-magnetic and electro-acoustic coupling
- Charge storage on a large load capacitor, on a super-capacitor and on a rechargeable battery
- Remote powering RFID smart systems and sensor nodes
- Backscattering data communication for telecoms and biomedical application
- Load modulation for telecoms and biomedical applications

Ultra-low power and efficient electronics (F. Maloberti/7h)
- Converters for power sources and energy storage
- Electronics strategies for energy harvesters
- Electronics for sensors and low-power sensor usages
- Sensor selection criteria for low-power consumption
- Low-energy sensor data processing, storage and transmission strategies

Wireless communications (A. Burg & C. Dehollain/7h)
- Introduction: applications, characteristics, protocols and models;
- The wireless channel: propagation principles, link budget;
- Access and controls: coding, modulations, medium access controls, performance metrics;
- Existing wireless solutions: proprietary, standardized;
- Practical constraints with energy harvesting

Digital low power VLSI design (A. Burg/3h)
- Power consumption in VLSI systems
- Low-power IC design techniques and physical limitations (reliability)
- Technology selection

System level design: Case studies (A. Burg/3h)
- System-level design tradeoffs for low power: processing/storage/communications
- Component selection and integration
- Power management
- Case studies

Seminars
D. Briand (2h)
A. Burg (3h)
C. Dehollain (3h)
F. Maloberti (1h)

Keywords
Autonomous, Electronics, Energy, Harvesting, Ultra Low-Power, Sensors, Communication

Learning Prerequisites

Required courses
Prior knowleage / basics in electronics and in microelectronics

Assessment methods
Report and oral presentation