

ISDN 2602: Internet of Things: Integrative System Design

Course Description:

The course introduces the fundamental concepts and skills on how to design an IoT (Internet of Things) system. The course includes fundamental theory and practical hands-on labs and projects for the student to acquire the basic knowledge on several key components for IoT systems, including circuits and sensors, signal processing, embedded systems, and communication and networking. The integration of different components is an important topic for this course. The students will acquire the knowledge through lectures, practical hands-on labs, and projects.

Intended learning outcomes (ILOs) of the course:

- Describe how an IoT system works
- Identify the basic components of an IoT system
- Learn how different components are integrated
- Acquire hands-on experiment technique
- Apply the knowledge in designing simple IoT system
- Carry out performance analysis of an IoT system

Coverage:

- **Part I: IoT/AIoT and Sensors**
 - IoT and AIoT
 - Sensors
- **Part II: Signals & Systems**
 - Signals and Systems
 - Analog vs. Digital
 - Systems: Impulse response
 - Frequency Analysis
 - Analog Modulation
- **Part III: Communication Systems**
 - Communication
 - Source Coding
 - Channel Coding
 - Modulation
 - Networking
 - MQTT
- **Part IV: Decision Making**
 - Machine Learning
 - Distributed Intelligence

Labs:

- Part I: Sensors and Signals (Arduino/MATLAB)
 - Lab 1: Sensors
 - Lab 2: Analog to Digital Conversion

- Lab 3: Frequency Analysis and Analog Modulation
- Part II: Communication and Networking (MATLAB/Arduino/ESP32)
 - Lab 4: Source and Channel Coding
 - Lab 5: Routing
 - Lab 6: MQTT

Final Project