

Graduate Courses in Systems Engineering

SE 5402 Architecture of IoT

What's Exciting About this Course? Applying the knowledge of systems engineering principles, processes, and methods to design embedded and networked systems. Understanding the constraints, requirements, architectures of hardware and software in cyber-physical systems.

Course Description. This course is designed to provide students and professional engineers with a thorough understanding of the design, development, validation and evaluation of IoT systems, especially in industrial domains with stringent timing and performance requirements. The student will develop skills in specifying the requirements for the target IoT systems, selecting the appropriate hardware and software platforms, and validating and evaluating the system performance. Special emphasis will be placed on the semester-based industrial projects that will be designed from selected industrial domains to address real-life problems.



Course Outcomes

- Develop several hardware, software, and network architectures for a given embedded system.
- Evaluate the cost, power, and performance tradeoffs associated with each architecture.

Topics: IoT System Examples, Architectural Design of IoT Solutions, Popular Embedded Platforms for IoT, CC2650 SoC as a Case Study, Real-Time Scheduling Algorithms, Spectrum Allocation, Noise and Interference, Suppression, NI USRP Platform, AD Pluto Platform, GNU Radio, Low-Power Wireless MAC Layer Design: ZigBee (802.15.4), Bluetooth, 6TiSCH, NB-IoT, High-Speed Wireless MAC Layer Design: IEEE 802.11 Families, Cellular Concept, Evolution from 1G to 5G, FDMA, TDMA, CDMA, OFDMA, SDMA, Narrowband IoT, Protocol Compression, 6LoWPAN Adaptation Layer, RPL, Routing Protocols, Popular IoT Gateway platforms, Edge Learning, Real-Time Parallel Data Processing Engine, Distributed No-SQL DB

Course Objectives and Links to Overall Program Goals

Students can design, develop, and integrate embedded and networked systems into complex cyberphysical systems. With the emergence of the Internet of Things, this course prepares engineers to design systems that satisfy stakeholder needs, while considering the complexity of new interfaces and interactions.