

Course content

This course introduces students to the core concepts of embedded systems and provides them with fundamental knowledge and skills in both hardware and software development. Given the rapidly advancing nature of embedded technology, the course focuses on the fundamental and universal principles of various components, which facilitates better understanding for undergraduate students.

Key topics covered in the course include:

1. Embedded System Basics: Fundamental concepts, architecture, and design principles.
2. Embedded Microcontrollers: Instruction sets, system structure, and development tools.
3. Peripheral Interfaces and Programming: GPIO, analog/digital interfaces, communication interfaces, and programming structures.
4. Software Design and Optimization: Embedded software design techniques, low-power design, and optimization methods.
5. Embedded Operating Systems: Basic principles and applications in real-time environments.
6. Network Protocol Stacks: Introduction to embedded networking and protocol implementations.
7. Practical Applications: Experimentation, analysis, and optimization for specific applications using modern tools.

Course Objectives

Knowledge

1. Understand the fundamental concepts and design principles of embedded systems.
2. Master the operational principles of embedded system components and their applications in solving engineering problems.

Skills

1. Analyze and describe complex engineering problems systematically using embedded systems knowledge.
2. Design innovative solutions for specific components and systems through an understanding of embedded system development processes.
3. Conduct experiments to optimize solutions based on chosen technical routes and processing techniques.

Competencies

1. Apply modern software and hardware development tools effectively to design embedded systems.
2. Select appropriate development tools based on application needs, ensuring efficient and accurate implementation.