



Course Code ECE-528	Course Title Embedded Systems	ECTS Credits 8
Department Engineering	Semester Fall or Spring	Prerequisites COMP-354, ECE-420 or ECE-520
Type of Course Elective	Field Engineering	Language of Instruction English
Level of Course 2 nd Cycle	Year of Study 1 st	Lecturer(s) Dr Harald Gjermundrød
Mode of Delivery Face-to-face	Work Placement N/A	Co-requisites None

Objectives of the Course:

The main objectives of the course are to:

- motivate the need for developing embedded system applications
- cover in detail the concepts of embedded systems and real-time operating system paradigms
- make students aware of the concepts of tasks, inter-process communication, synchronization, interrupts, and timers
- thoroughly discuss the presence of and describe the characteristics of latency in real-time system
- expose students to industrial development environment for embedded systems and industrial real-time operating systems
- introduce and discuss special concerns that real-time systems present and how these concerns are addressed.

Learning Outcomes:

After completion of the course students are expected to be able to:

1. explain the basics of embedded systems
2. identify what makes a system a real-time system
3. differentiate between developing “generic” software applications and embedded systems applications
4. apply the full life-cycle of developing embedded systems, i.e. design, software developing, build and load application to target host, and debug target host application.
5. critically assess reliability concerns and their implication for real-time embedded systems (failures, risks, and recovery).

Course Contents:

1. Motivation and introduction to Real-Time Embedded Systems
2. Overview of the discipline of embedded systems including hardware architectures, software development environments (Tornado), and Real-Time Operating Systems (VxWorks)
3. Introduction to VxWorks and Tornado

4. Developing for embedded systems and embedded systems initialization
5. Introduction to Real-Time Operating Systems (RTOS)
6. Familiarization with RTOS concepts: tasks, semaphores, message queues, interrupts, timers, memory management, and synchronization and communication
7. Reliability of RTOS applications, their failure model, and recovery techniques.

Learning Activities and Teaching Methods:

Lectures, Practical Exercises, Projects and Assignments.

Assessment Methods:

Homework, Projects, Mid-term Exam, Final Exam, Design Project, Literature Paper Presentation.

Required Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
Qing Li	Real-Time Concepts for Embedded Systems	CMP Books	2003	978-1578201242

Recommended Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
Sam Siewert	Real-Time Embedded Components and Systems	Charles River Media	2006	978-1584504689
Christof Wehner	Tornado and VxWorks	BoD	2006	978-3833444371