

Real-time systems design (ENGG4420) is a course that teaches real-time concepts from a system and computing perspective. The topics covered in this course are: hard and soft real-time system concepts for real time computer control; formal real-time systems design and analysis techniques (process-based, event-based, and Petri Nets); real-time operating system concepts for embedded and industrial applications; real-time programming using uCOS, VxWorks (or other equivalent RTOS for embedded applications) and Real-Time LabView; real-time scheduling concepts for real-time digital controllers; real-time scheduling algorithms for multiprocessor and uni-processor systems; system analysis of discrete systems using Z-transform; design and analysis of real-time digital controllers and digital control tasks; safety and reliability issues in real-time systems.

Prerequisite(s): ENGG*3640 (Microcomputer Interfacing); ENGG*2400(Engineering System Analysis).

COURSE OUTLINE FOR FALL 2008

INTRODUCTION - [SLIDES](#)

CHAPTER 1 (Weeks: 1,2,3): Real-Time Embedded Control.

Sections: [A. Dynamic Models; B. Feedback Control, PID, Tuning;
C. Implementing Real-Time Control Algorithms in Embedded Designs]

CHAPTER 2 (Weeks: 4,5): Real-Time Operating System Concepts (uC/OSII & VxWorks Concepts and Examples).

Sections: [A. Introduction; B. Common Kernel Objects; C. PIP, PCP Protocols;
D. Uniprocessor and Multiprocessor Scheduling Algorithms]

CHAPTER 3 (Weeks: 6,7): LabView Real-Time Application Development.

Sections: [A. LabView Real-Time Concepts. B. Examples of Real-Time LabView Applications.]

CHAPTER 4 (Weeks: 8,9,10): Design of Real-Time Digital Controllers.

Sections: [A. Z-Transform; B. Analysis of Discrete Systems;
C. Discrete Design; D. Real-Time Control Scheduling]

CHAPTER 5 (Weeks: 11): Petri Nets Modeling.

CHAPTER 6 (Weeks: 12): Safety and Reliability Issues in Real-Time Systems.