# EECS 111: System Software
# Lecture 11

Rainer Dömer

doemer@uci.edu

The Henry Samueli School of Engineering
Electrical Engineering and Computer Science
University of California, Irvine

## Lecture 11 Overview

- Course Administration
  - Assignment 3: Solution
  - Assignment 4
- Process Synchronization
  - Classic Synchronization Problems
  - Monitors and Condition Variables
  - Pthreads Synchronization

# Assignment 3

- Discussion
  - Race conditions, synchronization primitives, critical sections
- Project
  - Producer Consumer Problem, Threads, Busy Waiting
    - Program **`prodcons.c`** with producer, consumer threads
    - Producer thread computes Fibonacci series up to **`max`**, sends sequence of numbers to consumer
    - Consumer thread receives and checks numbers
    - Communication via bounded buffer (version 1)
      - Busy waiting
      - Uses up to BUFFER_SIZE-1 items
    - Analyze execution time, CPU load
  - Due
    - Tuesday, May 4, 2010, 12:00pm (noon)



# Assignment 4

- Discussion
  - Synchronization primitives, Application problems
- Project
  - Producer Consumer Problem, Mutex, Condition Variables
    - Program **`prodcons2.c`** based on Assignment 3
    - Fully utilize the buffer size in bounded buffer
      - Use up to BUFFER_SIZE items with help of counter
      - See Version 2 discussed in Lecture 9
    - Implement proper synchronization using Pthreads API
      - Eliminate race condition
      - Eliminate busy waiting
    - Analyze and compare execution time, CPU load
  - Due
    - Tuesday, May 11, 2010, 12:00pm (noon)

## Process Synchronization

- *"Operating System Concepts", 8th Edition,* by A. Silberschatz, P. B. Galvin, G. Gagne, John Wiley & Sons, 2009.
- Chapter 6
  - Classic Synchronization Problems
  - Monitors and Condition Variables
  - Pthreads Synchronization