**Topics:** signals, timers, curses, animation  
**Big Idea:** Event-driven programs  
**Approach:** Writing a Video Game  

**Outline**

Multi-tasking: Doing several things at once  
  How does the kernel do it?

Project: write a video game  
  outline: what it does  
  skills: space, time, multi-task

Multi-Tasking Techniques  
Real world multi-tasking - wait on customers, take calls, move car, check coffee  
Pong multi-tasking - wait on user input, keep ball moving in x and y  
Knowing when to act - block, poll, be signaled  
Our plan: block on user input, use alarms to schedule motion

Screen Management: the curses library  
  hello1: simple example  
  hello2: programming with curses  
  hello3: add a timer  
  hello4: add erase for animation

Staring pong: bounce a ball along a line  
  b1-sleep1 - erase, move, draw, sleep, repeat  
  b1-sleep2 - handle Ctrl-C

Signals  
  review of main ideas  
  control flow with signals -- magic function calls  
  how sleep works: uses signal SIGALRM  
  b1-alarm1.c: signals for bounce - alarm and pause

Interaction of signal handlers  
  idea: what happens if more than one signal arrives?  
  questions: window of opportunity, stackable signals?  
    EINTR on slow devices  
  advanced control of signals: block, handle, ignore?

Adding User control and Better Timing  
  b1-alarm2.c -- user control  
  Better timing: usleep, nanosleep, interval timers  
  b1-alarm3.c -- set_ticker and more controls

Animation in Two Dimensions  
  Extend ideas from bounce1d to two directions of motion  
  two sets of state variables:  
    horizontal speed, position, and counter  
    vertical speed, position, and counter