EE 4720   **Homework 1**   **Due: 18 September 2002**

At the time this was assigned computer accounts and solution templates were not ready. If they become available they can be used for the solution, either way a paper submission is acceptable.

Problem 1: Write a MIPS assembly language program that copies and converts an array of integers to an array of doubles. Use the template below.

```
################################################################################
## cpy_w_to_dbl

        ## Register Usage
        #
        # $a0:  Procedure input: Address of start of integer array (to read).
        # $a1:  Procedure input: Length of integer array.
        # $a2:  Procedure input: Address of start of double array (to write).

        .globl cpy_w_to_dbl
cpy_w_to_dbl:
        # Your code can modify $a0-$a2 and $t registers.
        # A correct solution uses 8 instructions (not including jr, nop),
        #  a different number of instructions are okay.
        # Points will be deducted for obviously unnecessary instructions.
        #
        # Solution starts here.

        jr $ra
        nop
```

Problem 2: What do the Sun compiler `-xarch` and `-xchip` options as used below do, and what are the equivalent gcc 2.95 (GNU C compiler) switches.

```
 cc myprog.c -o myprog -xarch=v8 -xchip=super
```

See `http://gcc.gnu.org/onlinedocs/` for gcc and `http://docs.sun.com` for the Sun Forte C 6 / Sun Workshop 6 cc compiler.

Problem 3: In Sun's CINT2000 SPEC Benchmark disclosure for the Sun Blade 1000 Model 900 Cu they specify a `-xregs=syst` compiler flag for several of the benchmarks compiled under the peak rules. *Hint: Use a search engine to find this rare flag. Guess what many of the search hits are to?*

(*a*) What does this flag do?

(*b*) How does it improve performance? *Hint: It affects one of the few low-level optimizations covered in class up to this point.*

(*c*) How often could this option be used in the real world?

Problem 4: Benchmark suites are suites because a single program might run well on a processor that runs most other code poorly.

At `http://www.spec.org` find the fastest processors using the "result" numbers from the SPEC CINT2000 benchmarks in the following categories: The fastest two Pentium 4s, the fastest Athlon, and the fastest Alpha. (Figure out how to get a result-sorted list of machines that shows processor type.)

(*a*) What programs might an unfair Intel advocate want removed from the suite?

For the parts below consider the relative performance of the programs in the suite. (Put the bar graphs for two different systems side by side and note the difference in shape.)

(*b*) Why might one expect the top two Pentia to be very similar? Are they in fact very similar?

(*c*) Why might one expect the Athlon to be more similar to the Pentium than to the Alpha? Does it?