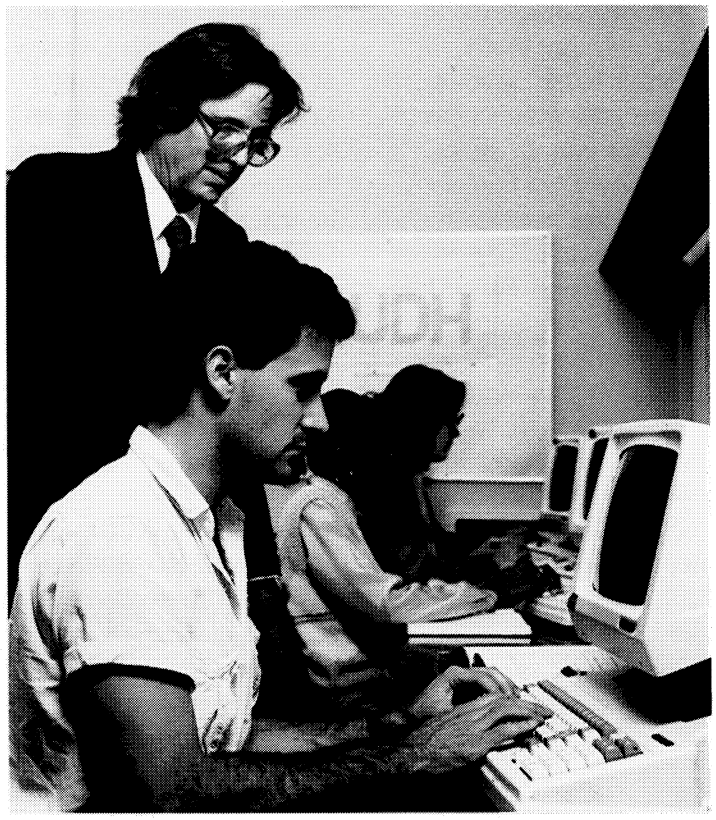
Computer Reliability



Computer programs developed by NASA and other government agencies have many potential applications other than their original purposes. To help computer users reduce automation costs by taking advantage of this resource, NASA's Computer Software Management and Information Center (COSMIC) collects, screens, stores and distributes programs that have secondary applicability. For the most part, COSMIC's customers are industrial firms and the applications are in industrial research and development or manufacturing technology. But often COSMIC finds unusual applications in such fields as medicine, meteorology or education. An example is the use of a NASA-developed program by Dr. J. Walter Bond at California State University, Dominquez Hills, who is creating a course in computer reliability modeling.

The course will examine three different computer programs, one of them NASA's CARE III, the others UCLA's ARIES 78 and ARIES 82. All three programs are designed to help estimate the reliability of complex, redundant, fault-tolerant systems. In computer design, software of this kind can predict—or "model"—the effects of various hardware or software failures, a process called reliability modeling.

The three programs have strong similarities, but they also have many differences. By assigning the same set of problems to each of the programs and analyzing the differences, students will be better able to understand the subtleties of programming. They will then investigate the "dynamic modeling" approach to computer reliability analysis, employing failure simulation techniques to assess the behavior of an entire system. This approach enables diagnosis of the cause of a computer failure by pinpointing the effects of the failure of various components, and it allows students to see where a problem is statistically expected to arise.

Dr. Bond's course is not purely theoretical. Eventually, the students' work will be incorporated into a software package that addresses the redundancy management of a computer system based on VLSI (Very Large Scale Integration) or VHSIC (Very High Speed Integrated Circuits). The underlying aim is development of advanced reliability modeling tools that would help assess future failure rates of sealed chip devices; this can contribute to a new generation of ultrareliable computers by allowing action to be taken during the design phase to provide extra redundancy where needed. ▲