1989 Annual Report

Dept of Computing and Information Sciences

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Table of Contents

Tables

Appendices

excellent in all areas. Our limited success in tackling this wide range of duties is due to the differential assignment of duties to faculty. While some faculty are principally teachers, some have a balanced teaching/research load, and some are principally researchers. However, efficiency alone will not solve the problem; additional faculty members is the priority for this department.

We continue to improve our research programs. The hard-work of the faculty is reflected in our modest success in increase of publications and extramural funding (Tables 3, 4, and 5). We are now fourth highest in Arts and Sciences while certainly one of the smallest departments. It is truly an interesting and rewarding experience to participate in the transition of the Department from a teaching unit in 1982 to a promising research unit in 1990.

We have been tremendously successful in acquiring undergraduate instructional laboratories; but the University has not seen fit to support the maintenance of these labs and they are deteriorating rapidly. From Table 10 you can see that our OOE budget has not increased measurably while the commitment to maintaining equipment and expendables has risen astronomically with the addition of the equipment grants. Even the industries that granted us the equipment are disgusted with the lack of maintenance support from the University. We also need help in acquisiton and maintenance of graduate student workstation labs, faculty workstations, and a parallel computing system.

Our pre-proposals for strategic planning set forth the two following distinct goals in order of priority. First, we must, with the help of KSU administration, build a critical mass of faculty, staff, computing facilities to meet the challenge of the Kansas Board of Regents to become a major thrust of Kansas State University. Second, we must integrate our research expertise and facilities into the research programs of other areas of science and engineering through a Center for Research Integration of Advanced Computing Technology.

II. Instruction

A. Undergraduate Program

Service Courses

The service component has continued to grow during the past year. The Introduction to Personal Computers course has grown from five sections to six, and there is sufficient demand for another section (demand thus exceeds 1000 students per semester). Many majors on campus now require CIS 110 as part of their requirements, so the demand should continue to be heavy. There are now approximately 75 personal computers available for that class, or about 12 students per machine. We have not received many complaints about machine availability, but have we have received many complaints about machines and printers not working, and complaints about a lack of consulting in the various labs.

Department Majors

After a rapid increase in Department majors in the early 1980's, and then a steady decline, the enrollment appears to have leveled and increased slightly. The fact that many jobs are available in computer science seems to be filtering down to the high schools. Several companies now make it a policy to visit high schools in their area to explain the opportunities that are available. Recruiters like our program but continue to express disappointment that we have low numbers of available graduates. We have continued to maintain close ties with the community colleges in Kansas to encourage those students to make their transfer to Kansas State.

We have raised significant funds for undergraduate scholarships. Our goal is to attract better students to KSU through both quality programs and financial scholarships. The sources of funds, as shown in Table 13, are alumni and industry. These funds, and matching funds from the Dean of Arts & Sciences are essential for excellence in education because we compete with the College of Engineering, which has almost unlimited scholarship funding.

We have continued to study accreditation by CSAB to determine what would be required in the process, and if there might be any long-term negative aspects. We feel our curriculum meets the guidelines, but we cannot meet the guidelines for faculty/student ratio. We continue to have a desperate need for new faculty.

We have revised the programming languages portion of the department majors and service courses, and those changes will be implemented in summer of 1990. Students will now take a baseline course called Fundamentals of Computer Programming which will implement problem solving in Pascal. This will give the students a foundation of structured programming skills on which to build. After completion of that course, students may elect to take one hour programming laboratories in BASIC, FORTRAN, or C. The newly structured fundamentals course will be taught on PC's, using a graphics approach. This structure will place additional demands on machine availability across campus. Software support will be a critical issue, we must upgrade our version of Turbo Pascal, obtain sufficient copies of BASIC and C, and find a suitable version of Modula-2 for the network server. Upgrading this software will cost about $10,000. The majority of use for this software will be for the service component and should be funded by a central authority.

We continue to need software upgrades for departmental machines to support Computer Science and Information majors. Our students need to be introduced to new software development tools, new languages, and new distributed database systems to keep on the leading edge of technology. Our machines continue to age to the point where we must consider replacement. Clearly, the most cost-effective and technology-effective is to have a Workstation environment. Industry is rapidly moving toward distributed systems, and our students must have that experience to compete in the job market.

Our lack of faculty forces the department to rely heavily on GTA's as teachers. The GTA's are dedicated,

but cannot bring the experience and mature perspective to a classroom of a faculty member.

The quality of our GTA's has increased because we were able to slightly raise the stipends. As the number of undergraduates declined in the late 1980's, there has been a corresponding increase in salary offers by industry. We must offer competitive stipends to attract quality GTA's, especially graduates from domestic institutions.

B. Graduate Program

The graduate program has been a mainstay in this department from our first day as an academic unit. Our priority has been to build a graduate education and research program that enhances the quality of the undergraduate program. Our MS graduates have always been in very high demand; and we produce 20% of all the MS degrees in the College of Arts and Sciences. Recognition of the quality of our MS program is documented in being selected by the AT&T Corporate Education Center as one of only two Computer Science Departments in the nation to have a summer on campus MS program for their employees. The other is the University of Illinois. Our principal goal in the graduate program is now to improve the quality of the PhD program and achieve international distinction in the areas of programming languages, distributed and parallel systems, and software, knowledge, and data engineering.

This past year we revised the MS program to allow more flexability in structuring the Program of Study. This permits students to do a thesis, a report, or a totally coursework option. We have also initiated new requirements for the PhD program which enhance the research emphasis at an earlier stage. We have decoupled the preliminary exam and the proposal for research, thus allowing a student to take the prelims earlier and get into his/her research project earlier. It also is an earlier date for a decision on whether the student will stay in the PhD program. This will enhance both the quality and quantity of research being done. It should also enhance the ability to acquire extramural research grants.

Our current emphasis is on improving the quality of the PhD research program. Thus, we have developed a handbook describing how to conduct quality research in the computing sciences. Improved quality should lead to more quality publications and thus more extramural funding for agencies like NSF whose new emphasis is clearly on quality not quantity of publications.

We have administered preliminary exams to 10 PhD students and have conducted an annual review of all graduate students. We do this to enhance the advising of the student. We have graduated 4 PhD students and 32 MS candidates. This means we are now producing as many graduates from the graduate program as we are graduating from the undergraduate programs.

The quality of students applying to the graduate program has risen dramatically in the last few years. GRE scores are up in some areas as much as 15-20%; and we have a large number of applicants. We receive 1500 inquiries per year, process 300 complete applications, admit 90 students, and enroll approximately 30 per year. The number of student enrolled would be higher if our GTA and GRA stipends were higher. The number of students enrolled in our graduate program has decreased because we are offering a higher proportion of our GTAs to PhD students who need more money and stay longer in the program. We need more money to build the graduate program. It generates more state funds and enhances the reputation of the Department and University. See Section VI on strategic planning for our goals and needs in this area and Table 2 for enrollment patterns.

III. Faculty

This past year the faculty has published 37 refereed conference and journal articles, acquired $432,000 of extramural funding, acquired $700,000 worth of computing equipment, and done an admirable job of instruction in a understaffed and underfunded environment. See Appendix 4 for teaching assignments, Appendix 5 for committee work, Appendix 6 for research publications, Appendix 7 for a summary of grantsmanship, Appendix 8 for a description of current research projects, Appendix 9 for professional activities, and Appendix 11 for faculty presentations for 1989.

We are currently a faculty of size 14. In order to achieve distinction as a research department in the computing sciences, we must have a critical mass of 26 faculty members. There are no successful programs in the country with fewer than 26 faculty members. As a result, the top priority in this department is to hire more faculty members. Specifics for this goal are in Section VI. Strategic Planning.

This year we did not lose a faculty member to another institution or to industry, the first time in the last five years. It is a real pleasure to work in a department where all of the faculty members have a common goal, the advancement of the department. The faculty, as a whole, are good teachers and developing researchers. They are concerned about the progress of both graduate and undergraduate students; they are committed to achieving excellence in their chosen specialty; and they contribute heavily to the Department, the University, the State and the Nation. Specifics on the accomplishments and duties of the faculty for 1989 are presented in Appendices 4,5,6,7,8,9, and 10.

We are far behind our peers in faculty salaries. Table 9 contains a comparison of KSU CIS faculty average salaries with the national average salaries for Computer Science PhD-granting departments across the U.S. In some areas we are as much as 30% below the average of our peers.

Another area of difficulty is in the area of research equipment. We are not yet sufficiently equipped with computing facilities to attract solid faculty in the areas of software engineering, data systems, knowledge engineering, programming languages, and parallel and distributed processing. Last year, we hired Dr. K. Ravindran from Bell Northern Research in Ottawa, Canada. His industrial experience in distributed computing and computer networking, and his research background make him an extremely valuable addition to our faculty. However, we made two other offers to very good faculty candidates who would not accept our offer because we lacked the parallel computing facilities to support their research. Both would have generated substantial extramural funding for this department.

We are beginning to establish interdisciplinary research programs with other departments on campus. Dr. Zamfir is working with Dr. Isenhour in Chemistry on application of artificial intelligence concepts to analytical chemistry. Dr. Unger is working with Dr. McNulty in data aggregation and data base security. Dr. Gustafson is working with Dr.s McNulty (Statistics and Economics) on software metrics. Dr. Schmidt and Dr. Melton are working with Dr. Strecker in Mathematics on category theory applications in programming languages.

Dr. Schmidt has initiated a post-doctoral research program in programming languages. Post-doc appointments include Pascal Fradet from Rennes, France, Karoline Malmjkaer from Denmark, and Olivier Danvy from Paris, France. This is a new and exciting program for CIS because it means Dr. Schmidt has an international reputation capable of drawing the best researchers to KSU.

IV. Research

Research activities in this department are broadly categorized into four general areas: programming languages, software engineering, data base systems, and distributed and parallel systems. Appendix contains more detail on each research project.

Programming Languages

Dr. David Schmidt works in the area of denotational semantics, the meaning of computer programs. He is currently working with three students in related areas. He is working with Susan Even on using action semantics for the design and analysis of programming languages. He is working with Kyung-Goo Doh and Dr. Masaaki Mizuno to develop soundness proofs of the information flow control algorithm of Mizuno. Finally, he is working with Dean Lass on the synthesis of compilers from denotational semantics descriptions. Austin Melton (on sabbatical) is working with Professor Neil Jones on local functional parameters and Kleene's Recursion Theorem as applied to programming languages. Dr. Melton is also working on languages for graphic and category theory as well as automatic program specialization.

Software Engineering

Dr. Austin Melton is working on the synthesis of models of software complexity measure. He is also working with Dr. David Gustafson on standard software measures and mathematical foundations for software measures. Dr. Gustafson is also working on stochastic foundations for software measures. Dr. Hankley and Dr. Gustafson are working on formal program and design specifications. Finally, Dr. Gustafson and Dr. Wallentine are working on expert systems in software engineering.

Data Base Systems

Dr. Maria Zamfir-Bleyberg is developing the formal foundations of object-oriented data bases and is developing a prototype using an object-oriented programming system. Dr. Melton is working on fuzzy relational data bases. Dr. Unger is working on information dissemination deterrents and statistical data base security and integrity.

Distributed and Parallel Computing Systems

Dr. Rodney Howell is working on self-stabilization of concurrent systems, complexity of concurrent systems as represented by Petri Nets, hard real-time scheduling algorithms, and verification of concurrent systems. Dr. Hankley is working on temporal specification of Ada semantics. Dr. Unger is working with Dr. McNulty on active data elements. Dr. Mizuno is working on secure information flow in distributed systems, recovery in distributed systems, and distributed mutual exclusion algorithms. Dr. Unger is working on office information systems. Dr. Zamfir-Bleyberg is developing the initial algebra approach to formal models of concurrency. Dr. Ravindran is developing high performance algorithms for ISDN switches and fault-tolerant remote procedure calls. Finally, Dr. Wallentine is working on a knowledge base to help in the debugging of distributed programs and algorithms to implement distributed discrete event simulation on distributed and parallel systems.

Extramural Support

Tables 4a and 4b give the trends of extramural support for this department over the past several years. Clearly we have been successful. In this past year we had more than $500,000 in research and educational funding active within the department. We acquired $750,000 worth of computing equipment for research support for the University (SCS-40 vector computer). Also, we have approximately $200,000 worth of grant proposals currently under review. Appendix 12 contains details about our grantsmanship activities. We expect to improve on this area in the next several years, but only if we have a larger faculty so that we

can cover both research and teaching duties.

V. Computing Facilities

Traditionally, university central computing administration has provided a critical mass of computing facilities for the campus. However, at KSU, due to funding constraints and lack of leadership (see EDUCOM report 1988), only mainframe facilities have been provided to any significant degree. Thus, the acquisition of all workstation, PC, networking, software, vector computers, parallel computers, graphics, hypermedia, etc. has been the responsibility of the departments. This department acquired more than three million dollars worth of equipment and software to support its research and teaching programs. See Table 4b for details. However, acquisition of maintenance funds from extramural sources is virtually impossible. Thus, we are left "holding the empty bag" while central computing has received the bulk of the computing funds (while not writing one grant proposal). To be more specific, our OOE has risen an average of 2% per year for the past five years; during this same period we have increased our laboratories by 140 PC's, 15 mini-computers, 4 super-mini computers, a mini-supercomputer, five networks, & 300 software systems. We have also grown from 50 to 500 users. This past year the problem has been exacerbated by the acquisiton of the mini-supercomputer SCS-40. There are also no funds for the maintenance of this system which is a university-wide resource.

To be more specific, our OOE (see Table 10) has risen an average of 2% per year for the last five years. Considering inflation, this is a decrease of 5 to 10%. In the same time period, we have increased our laboratory inventory by more than 140 PCs and workstations, 15 mini-computers, 4 super-minicomputers, five networks, and a near-supercomputer. We have also increased the number of users of our laboratories from 50 to 500. It is time for KSU to help support these educational and research facilities.

Unless we resolve this problem, no new grant proposals will leave this department until the University commits maintenance funds and matching funds for software. Furthermore, our labs will continue to decline until we receive maintenance funds to maintain our current laboratory base.

Without workstations for current and new faculty and a parallel computing system, we cannot hope to recruit solid research faculty in distributed and parallel computing. A more complete delineation of the need for computing facilities is presented in the section on strategic planning.

VI. Strategic Planning

The CIS Department has been deeply involved in strategic planning for several years. In parts A and B of this section we delineate the specific elements of our planning program. The priority is to build a critical mass of faculty, graduate students, equipment, and extramural funding to continue our climb to prominence in programming languages, software engineering, data base systems, knowledge systems, and distributed and parallel computing. This is given in part A. Second in priority is the establishment of an interdisciplinary Center for Research Integration of Advanced Computing Technology, described in part B. At the present time, we need help from the College and University if we are to pursue either of these approaches to strategic planning. In Section C, we present the goals for 1990, with assumptions on support from the University.

A. Critical Mass for Expanding Essential Research and Graduate Education Programs Highest Priority Needs

Purpose and Rationale

The Department of Computing and Information Sciences is younger than Monday Night Football and the landing of a man on the moon; it was created in response to an overwhelming need to enable industries to be competitive, to empower other disciplines with computing power, and to provide knowledge workers for the 21st century. However, the Department has never been allocated reasonable resources to accomplish these tasks. We have been very successful, however, in producing graduate and undergraduate degrees, increasing our research productivity and providing our own computer labs. In this proposal, we are asking for the resources to accept the challenge of the Kansas Board of Regents in the Mission Statement for KSU to be a major thrust of Kansas State University. Specifically, increasing the number of faculty, improving the stipends for graduate students, and enhancing the research and instructional laboratory environment will substantially increase the size of the graduate program, increase extramural funding, enhance the publication rate in scholarly journals, and improve the quality of the undergraduate programs.

Relationship to KSU Themes

Enhancement of the graduate education and basic research programs of CIS is central to meeting the Regents' challenge. Strengthening our research programs will also improve the quality and quantity of undergraduate education in this high demand area. Electronic delivery of graduate coursework will extend the influence of KSU to industries nationwide.

Proposed Activities

If we are to be competitive in acquiring funding from such agencies as NSF, according to their Notice No. 107, we must "contribute to the education and the development of human resources in science and engineering at the postdoctoral, graduate, and undergraduate levels." More specifically, we must publish in first-rate journals, develop high quality graduate and post-doctoral students, and develop a critical mass of graduate students with which principal investigators can work. Currently, we do not have a "critical mass" of faculty in any area; if we lose one person, we may well lose an entire area. It is impossible to compete for "big science" grants without such a critical mass. We propose to strengthen current areas of expertise with additional faculty in the following three broad areas: programming languages, parallel and distributed systems, and data, knowledge, and software engineering.

It is essential that we install workstations for both the graduate and undergraduate students. Without this laboratory environment, students cannot develop their engineering and experimentation skills or use current research software. In the past we have received lab computers from industrial grants, but because KSU was unable to provide maintenance, industry is reluctant to continue the practice.

It is essential that we improve graduate student stipends. Our current offers are 25% below the offers of some of our peers. With higher stipends (approx. $1000 a month) we can increase the number of quality, research-oriented students who accept GTA and GRA positions. We receive more than 1000 inquiries a year and process more than 300 applications for graduate school, admitting 20-30, of which 10 to 15 accept GTA or GRA offers. With additional faculty, better stipends, and better equipment, we could enroll an additional 30 graduate students (a 50% increase).

With additional faculty, we can reduce our student to faculty ratio, and qualify our bacclaureate degree programs for national accreditation.

At the request of AT&T, we propose to offer MS coursework electronically through National Technological University (NTU). We have a current demand for such courses: in addition to their annual summer school attendance, our AT&T Summer On Campus students must receive MS coursework at their business locations (18 sites across the nation). This initial experience with electronic delivery of courses will open the doors to additional industrial clients for our graduate level courses. Because many computer and computing-intensive industries, such as IBM, Xerox, AT&T, and DEC are members of NTU, we can reach into industry throughout the nation. Specifically, we can and should reach into the industrial areas of Kansas City and Wichita to be supportive of Kansas economical development.

Responding to the increased demand for graduate level degrees in computing technology and information management by nationwide industries like AT&T and Kansas industries such as Boeing, United Telecom, and the insurance companies, we propose to develop two new Master's degree programs - Master of Software Engineering (MSE) and Master of Management Information Systems (MMIS). The model for the MSE is provided by the Software Engineering Institute at Carnegie-Mellon. The model for the MMIS is the program at Arizona State University.

Support for improving the quality of the Joint PhD program with the University of Kansas is essential. We must establish a video link between the two departments to enable us to teach joint PhD level courses, conduct research seminars, conduct collaborative research projects, and interact on economic development projects. KTEC has expressed interest in this type of cooperation.

Resource Requirements

According to the 1987-88 Taulbee Survey of PhD-granting computing sciences departments in the U.S. and Canada, the top 25 departments have an average faculty size of 38. We have 14 faculty members. In summary, in order to meet the Regents' challenge, we require ten additional faculty members ($600,000 per year) to increase the size of the graduate student enrollment, increase extramural funding, and accommodate the expected growth in the undergraduate program. It would also permit us to teach the introductory computing courses that are mandated by the Strategic Planning Charge to the College of Arts and Sciences. We need 25 workstations ($125,000) and software ($20,000 per year). We also need a parallel computing system ($500,000). This can be shared with others across the University through the companion RIACT proposal. Additional graduate stipends amount to $72,000 in incremental funding. Initial fees for NTU are approximately $5,000. Other units such as Engineering could utilize NTU as well. A video link to KU would cost approximately $200,000 for KSU's end. This could also support other disciplines such as Biology, Chemistry, and Geology (cooperative PhD program).

Funding Sources and Outcomes

We expect to produce an additional 800 student credit hours at the graduate level. ($250,000 per year by regents' formula.) One NTU course per semester will generate approximately $20,000 per year. In the past 4 years, we have added 4 research faculty, increased our extramural funding by $250,000 per year, and acquired $4 million of equipment grants. We have not been unsuccessful; we just have a small faculty. With the additional resources, we anticipate an additional $1 million per year in extramural funding.

B. RIACT - Research Integration of Advanced Computing Technology Enabling Interdisciplinary Research Second Level Priority

Rationale and Purpose

If KSU is to be a leading comprehensive university in the 21st century, all disciplines within the university structure must be effective in producing new knowledge; this knowledge must be transferred to Kansas economic enterprises to maintain and improve their competitive stature in a global market-place. The power of computer technology enables this university/industry partnership to advance the economic well-being of Kansas. We propose to establish a center for Research Integration of Advanced Computing Technology in the CIS Department to enhance the research infrastructure of KSU, to contribute to the economic development of Kansas, and to transfer technology to Kansas educational, business, and industrial enterprises.

Relationship to Themes

RIACT (pronounced react) will be a collaborative research and development center which supports graduate students, enhances research capabilities in many departments across campus, contributes new technology to industry, and enhances the competitiveness of business in Kansas. RIACT is also intended to be the incubator for new graduate degrees which train a new type of scientist, one who is a computing scientist and who also is an expert in another science or engineering discipline.

Proposed Activities

For many years KSU researchers have been hampered in their work because they have to re-invent the computing wheel each time they encounter a computational problem. CIS has not possessed the resources to amplify the progress of others; that is, our mission is so broad and our faculty are so few that we were forced to isolate ourselves from the problems of Kansas industry and other researchers. In our technological vacuum, we have supplied technology which may or may not have been useful to other researchers. We have been principally on the supply side. Within RIACT we intend to become more demand-oriented developers of computing technology; we must work with industry and other academic disciplines in developing computing solutions to their problems.

Our initial emphasis will be to work with scientists and engineers on computing paradigms to enhance their research programs. Specifically, we must develop expertise in parallel and vector computing. We also need to increase our graphics expertise to enable scientists to interpret research results via a technology known as Scientific Visualization. In addition, we need to enhance our expertise in artificial intelligence and real-time systems to aid researchers in management of resources (Ag., Bus., sciences, and Engineering) and development of new experiment control facilities.

RIACT must be able to respond quickly to the rapid technological change in business, education and industry. We thus need to increase our capacity to enable Kansas communications and manufacturing capacity through the use of computer software. Specifically, the communications industry in the Kansas City region (United Telecom is a Kansas corporation) and the aircraft industry (Boeing Military Airplane and Boeing Computer Services) are prime targets for economic development enhancement. Software Engineering and Computer Networking research and development are the keys to productivity enhancement for these companies.

In the future, we envision working with Business in development of Management Information and Decision Systems and Office Automation Environments. These are vital areas to the Kansas Economy. We envision collaborative arrangements with Education in the development of Computer Assisted Instruction to empower the state's educational capacity. We will place heavy emphasis on the development and/or

integration of computer-based cooperation systems which support (both centralized on campus and geographically distributed) collaborative efforts. Since RIACT is intended to be an entity which can respond quickly to changing research and industrial directions, new areas and projects will continually arise. Assembly of sufficient resources and expertise to solve a new computing problem must be a principal goal.

Finally, RIACT is intended to be the interdisciplinary research environment that develops new graduate degree programs whose goal is to train scientists and engineers that are experts in applying computing technology to generating new knowledge in their own discipline. It will be the responsibility of the research faculty from the broad spectrum of disciplines within RIACT to develop these degree programs and recommend the academic structure for developing the students. The MS/PhD Degree Option in the Computer and Natural Sciences program at Washington State University is an appropriate model to consider.

Resource Requirements

We have already acquired a significant computing capacity through industrial grants. These systems support a variety of disciplines across the campus from Agronomy to Extension to Engineering to Biology to Physics to Chemistry to Math to Statistics, etc. We need to enhance that capacity with a parallel computing system, with state of the art artificial intelligence software, and with high resolution graphics workstations. Further enhancement of the research infrastructure requires new classified staff and graduate research assistants to develop the software for real-time programming of experiments, to parallelize large modeling systems, to develop large simulation systems, to program large knowledge and data bases, and to operate the facilities of RIACT.

A minimum of four new faculty (parallel processing, artificial intelligence, graphics, and software engineering) are needed. Joint appointments with various departments such as EECE, Physics, Math, Statistics, etc. are appropriate. This would be a yearly investment of at least $240,000. Additional GRA and classified staff would would cost an additional $90,000. A parallel processor would cost $500,000. High-resolution color graphics workstations would require an additional $100,000. Finally, funding for software acquisition and system maintenance would be approximately $150,000 per year.

Potential for Funding Sources and Outcomes

Since computing and information technologies are the enabling technologies for high tech industry, there is strong potential for support from Kansas industries such as Boeing and United Telecom. KTEC and Centers of Excellence funding is also well-suited. Federal agencies are interested in funding collaborative efforts of this kind, including the Information Science and Technology Office of DARPA, the NSF Science and Technology Centers, and the NSF Computing Infrastructure grants. Acquisition of extramural grants for computing resources and staff salaries will be a principal effort within RIACT.

We have already established that computing equipment companies have confidence in us through $4 million of equipment grants in the past 4 years. We are now asking for the opportunity to empower other research and industrial concerns with advanced computing and information systems technology. We are confident that RIACT will enable interdisciplinary research and thereby improve extramural support (by $1 million a year), increase the number of research and development publications, enhance the attractiveness of KSU to graduate students, support scholarly activity in Arts and Humanities, and improve the economic health of Kansas (by developing foundations for and prototypes of new software products).

C. Plans for 1989-90 Academic Year

Objectives:

Our objective is to accept the challenge of the Board of Regents to become a major thrust of KSU. In 1989-90 we intend to improve the CIS Department and advance the cause of the College of Arts and Sciences and KSU in empowering people and generating new knowledge. However, without additional

funding as indicated in the strategic plans attached to this memorandum, many of the goals stated below will go unattained.

Goals:

A. Instruction

1. We will review and probably restructure our service course offerings, CIS 110 and CIS 200. Currently, more than 1100 students per semester enroll in these two courses. With the new Charge to the College to teach introductory computing courses in CIS, we expect an additional 400 students per semester. Our review will focus on the fundamental goal of creating knowledge workers for the 21st Century. We will work with other departments to move comparable courses into CIS, but not before more faculty resources are available.

2. Better integration of the undergraduate and graduate (specifically M.S.) degree programs in this department must ensure that our own BS graduates, as well as incoming graduate students, have a smooth transition into the MS program.

3. It is essential that we move the instructional program laboratory work from PCs to workstations. We will work with ACAC to establish University-wide generic workstation lab and we will work with industry and the College of Arts and Sciences to acquire specialized workstations.

4. We will review the PhD program. Our approach is to improve the quality of the program by providing research guidelines to both students and professors which reflect our goal to attain international stature.

5. We request funds to install a graduate student recruiting program which includes trips to four-year undergraduate schools in the region and strong advertising with graduate student brochures. We have no funds for this activity and the Graduate College can offer no help. This type of assistance should be a University priority.

6. At AT&Ts request, we will investigate delivery of MS coursework remotely to many different AT&T sites across the country. Without this mechanism (assumed to be National Technological University), we may lose the AT&T Summer on Campus program. However, we cannot teach NTU courses unless we have the initiation fees and an additional faculty member.

7. We continually seek to improve the quality and quantity of all departmental programs (BS/BA/MS/PhD) in accordance with the strategic planning documents of Attachments I and II. However, we cannot implement such plans without additional funding.

8. We request permission and funds to apply for accreditation of our BS/BA programs by the Computer Science Accreditation Board.

9. We, in conjunction with the College of Arts and Sciences and the Graduate College, must make plans to solve the problem of low GTA stipends. At the present time, we have a small revolt among our graduate student population. We depend very heavily on this group of instructors. Without their commitment, we cannot exist.

10. In conjunction with the College of Arts and Sciences, we will seek to solve the problem of maintenance support for specialized computing labs in this department. These are laboratories like other traditional chemistry and physics laboratories. They should be supported by a base budget, not

through allocations from a central university computing committee. Without support, they will soon be of no use.

11. We will work with the College of Arts and Sciences to resolve a problem in the graduate student applications process. We currently receive more than 1500 inquiries for graduate school each year. We process more than 300 completed applications per year. Presently, this is poorly handled by student workers and we miss some very good graduate student prospects. We need a full-time classified employee who can handle this task.

B. Research

1. We need to hire two new faculty members to begin to build a critical mass of research expertise. This is well-documented in Attachment I.

2. We will continue our efforts to increase extramural research funding.

3. We will write a grant proposal in hopes of acquiring a parallel processing system. (However, preliminary indications from one industrial enterprise, AT&T, are not good because of our lack of maintenance of their current grant equipment.)

4. Our goal to become nationally known will be enhanced with higher quality publications. This is in keeping with the new statements from NSF about quality of publications versus quantity. Thus, we will place renewed emphasis on quality of publications.

5. We will endeavor to establish a strong post-graduate program in programming languages. Currently, few departments of Computer Science offer this sort of program; but it is essential to improving our international stature and improving our research program. It is a sign of our maturation as a discipline and a department.

6. Publication of a departmental research brochure should enhance national awareness of our research programs.

7. We will "make time for research" among all of our other duties. As we have done in years past, differential teaching and research loads are the norm. This permits the more productive researchers more time for researcher.

C. Department and University Service

1. We will install and operate the SCS-40 as a University resource. This is the beginnings of RIACT, a center for Research Integration of Advanced Computing Technology. Again, without funding as indicated in Attachment II, this effort will fade almost immediately.

2. We will continue to play an active role on College and University Committees (Telecommunications and the Executive Committee of Telecom, CCOP, ACAC, Physical Sciences Subcommittee of Graduate Council, Graduate Council, A & S Deans's Advisory Committee, ISBR, CRCCA, General Laboratory Committee, etc.).

3. Publication of a departmental newsletter to inform alumni and raise funds will be continued.

4. Fund-raising from alumni who work for IBM will be intensified to acquire funds for undergraduate scholarships. We will also start a fund-raising campaign with employees of AT&T to support the graduate program.

Table 1
Undergraduate Enrollment for Fall Semesters 1981-1989

	1981	1982	1983	1984	1985	1986	1987	1988	1989
Freshmen	189	192	193	148	112	77	60	84	90
Sophomore	80	126	131	96	86	66	71	54	54
Junior	78	111	134	114	103	80	71	71	60
Senior	84	103	146	198	160	134	116	85	82
Total	431	532	604	556	461	357	318	294	286

Table 2
Graduate Enrollment for Fall Semesters 1981-1989

	1981	1982	1983	1984	1985	1986	1987	1988	1989
Master	89	80	65	63	83	68	67	43	43
Ph.D.	14	13	9	11	10	21	21	21	20
AT&T (Part-time MS)	31	57	62	72	70	62	50	52	51

Table 3
Allocated Faculty Positions FY 82 - FY 90

1982	1983	1984	1985	1986	1987	1988	1989	1990
10.5	10.5	12.5	12.5	12.0	12.5	12.5	13.5	14.0

Table 4a
Extramural Funding FY 82 - FY 89

1982	1983	1984	1985	1986	1987	1988	1989
135,425	160,000	231,734	214,639	219,435	306,337	152,422	432,535

Table 4b
Extramural Equipment Grants FY 85 - 89

1985	1986	1987	1988	1989
50,000	300,000	1.3M	700,000	750,000

Table 5
Faculty Publications FY 81 - FY 89

	1981	1982	1983	1984	1985	1986	1987	1988	1989
Refereed Publications	4	3	3	5	6	14	22	32	37
Books	0	0	3	0	1	3	1	0	0
Totals	4	8	10	10	10	19	26	32	37

Table 6
Computing Facilities

Type	Quantity	Equipment
Super-mini	1	DEC VAX 11/780
Super-mini	2	AT&T 3B15
Super-mini	1	Harris HCX-9
Mini	10	AT&T 3B2 400
Mini	5	AT&T 3B2 300
PC	10	AT&T 6300
PC	60	AT&T 7300
PC	20	AT&T 6310
PC	30	Zenith 150 PC
PC	16	Apple Macintosh
Terminal	10	AT&T 4425
Terminal	11	AT&T 610
Terminal	40	Esprit 6110
Terminal	10	TeleVideo 925
Terminal	20	Various CRT Terminals
Graphics	1	AT&T Frame Creation System
Data Switch	1	Equinox DSS-1
Printer	1	Apple Laserwriter
Printer	3	Apple Imagewriter
Printer	2	Centronics Linewriter 800
Printer	1	Dataproducts B600
Printer	5	Okidata Dot Matrix Printer
Printer	4	Epson Dot Matrix Printer
Printer	3	NEC Spinwriter 5510
Printer	1	QMS Lasergrafix 800
Printer	1	AT&T 495 Laser
Printer	4	AT&T 479 Dot Matrix
Projector	1	Sony Projection System
Projector	1	Kodak Overhead Projection System
Modem	10	Racal-Vadic Modem
Modem	15	AT&T 212A Modem
Network	2	Ethernet
Network	2	Appletalk
Network	1	StarLAN
Workstation	15	Sun Workstations
Mini-super	1	SCS-40/CTSS

Table 7
Graduate Degrees FY 81 - FY 89

	1981	1982	1983	1984	1985	1986	1987	1988	1989
Master	27	25	36	25	35	39	40	42	32
Ph.D.	2	0	2	2	1	1	3	2	4
Totals	29	25	38	27	36	40	43	44	36

Table 8
Undergraduate Degrees FY 81 - FY 89

1981	1982	1983	1984	1985	1986	1987	1988	1989
45	47	61	62	102	104	86	69	35

Table 9
Department Salaries Compared to National Average

	1984-1985	1985-1986	1986-1987	1988-1989	%Deficit
Assistant Professor	32,742	36,705	37,024	41,184	
National Average	37,455	39,544	41,945	43,959	6.7%
Associate Professor	34,920	36,696	37,266	42,966	
National Average	43,115	45,062	47,425	50,806	18%
Professor	42,060	43,245	44,478	49,533	
National Average	56,952	59,503	63,037	67,205	35.6%

Table 10
OOE Funding FY 82 - 90

1982	1983	1984	1985	1986	1987	1988	1989	1990
37,336	37,336	39,236	41,590	43,669	37,119*	43,669	43,669	44,669

* 15% budget cut

Table 11
Total Student Credit Hours
FY 84 - FY 89

1984	1985	1986	1987	1988	1989
12,519	14,466	14,044	12,903	12,323	11,808

Table 12

Number of Students Enrolled in Service Courses (100 and 200 level) FY 84 - FY 89

1984	1985	1986	1987	1988	1989
2,495	3,105	2,983	2,837	2,577	2,757

Table 13
Department Scholarships

Name	Class	Fund	Amount
Troy Anderson	SR	IBM/Dean Match	1,000
Teresa Detter	FR	IBM/Dean Match	1,000
Jared Friesen	JU	Phillips/Dean Match	1,000
Greg Haynes	FR	Conoco	1,000
Chris Thompson	JU	Conoco/Dean Match	1,000

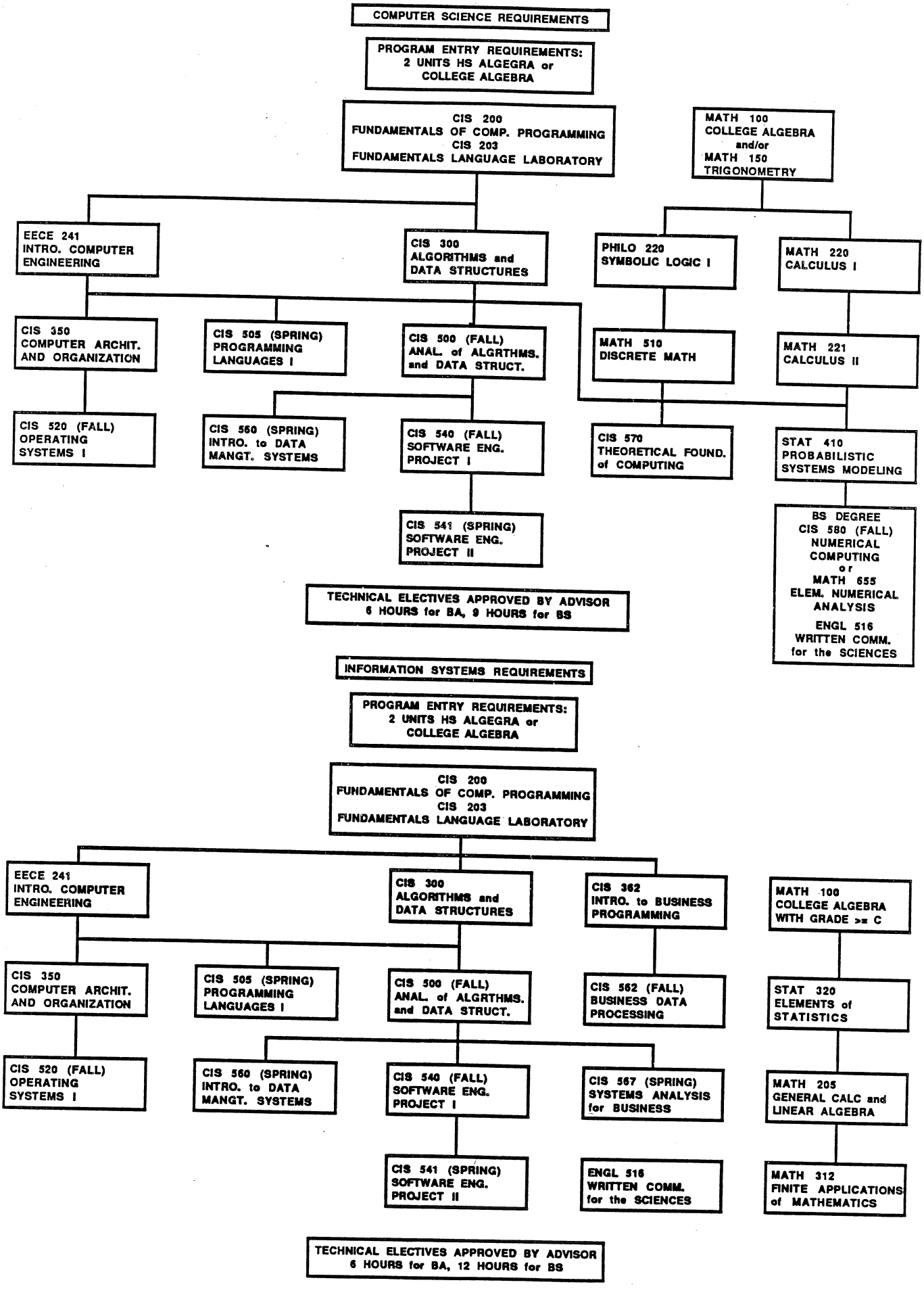
KANSAS STATE UNIVERSITY

1990 GUIDE TO REQUIREMENTS

FOR

MAJORS IN COMPUTER SCIENCE & INFORMATION SYSTEMS

To major in computer science or information systems you must meet the general requirements of the University, the requirements of the College of Arts and Sciences, and the requirements of the Department of Computing and Information Sciences (all of which are listed in the General Catalog). The requirements for the BS and BA degrees are outlined on the sample curriculum guide check sheets. An up-to-date copy of the curriculum guide should be kept in your folder in the CS office for your use during advising. Please update your guide form when you pick up your enrollment permit and take the updated version with you when you see your advisor. Please return it to the CS office - Nichols Hall 234 - after you have been advised.


COMPUTER SCIENCE REQUIREMENTS
PROGRAM ENTRY REQUIREMENTS: 2 UNITS HS ALGEGRA or COLLEGE ALGEBRA
CIS 200 FUNDAMENTALS OF COMP. PROGRAMMING
CIS 203 FUNDAMENTALS LANGUAGE LABORATORY
MATH 100 COLLEGE ALGEBRA and/or MATH 150 TRIGONOMETRY
EECE 241 INTRO. COMPUTER ENGINEERING
CIS 300 ALGORITHMS and DATA STRUCTURES
PHILO 220 SYMBOLIC LOGIC I
MATH 220 CALCULUS I
CIS 350 COMPUTER ARCHIT. AND ORGANIZATION
CIS 505 (SPRING) PROGRAMMING LANGUAGES I
CIS 500 (FALL) ANAL. of ALGRTHMS. and DATA STRUCT.
MATH 510 DISCRETE MATH
MATH 221 CALCULUS II
CIS 520 (FALL) OPERATING SYSTEMS I
CIS 560 (SPRING) INTRO. to DATA MANGT. SYSTEMS
CIS 540 (FALL) SOFTWARE ENG. PROJECT I
CIS 570 THEORETICAL FOUND. of COMPUTING
STAT 410 PROBABILISTIC SYSTEMS MODELING
CIS 541 (SPRING) SOFTWARE ENG. PROJECT II
BS DEGREE CIS 580 (FALL) NUMERICAL COMPUTING or MATH 655 ELEM. NUMERICAL ANALYSIS
ENGL 516 WRITTEN COMM. for the SCIENCES
TECHNICAL ELECTIVES APPROVED BY ADVISOR 6 HOURS for BA, 9 HOURS for BS
INFORMATION SYSTEMS REQUIREMENTS
PROGRAM ENTRY REQUIREMENTS: 2 UNITS HS ALGEGRA or COLLEGE ALGEBRA
CIS 200 FUNDAMENTALS OF COMP. PROGRAMMING
CIS 203 FUNDAMENTALS LANGUAGE LABORATORY
EECE 241 INTRO. COMPUTER ENGINEERING
CIS 300 ALGORITHMS and DATA STRUCTURES
CIS 362 INTRO. to BUSINESS PROGRAMMING
MATH 100 COLLEGE ALGEBRA WITH GRADE >= C
CIS 350 COMPUTER ARCHIT. AND ORGANIZATION
CIS 505 (SPRING) PROGRAMMING LANGUAGES I
CIS 500 (FALL) ANAL. of ALGRTHMS. and DATA STRUCT.
CIS 562 (FALL) BUSINESS DATA PROCESSING
STAT 320 ELEMENTS of STATISTICS
CIS 520 (FALL) OPERATING SYSTEMS I
CIS 560 (SPRING) INTRO. to DATA MANGT. SYSTEMS
CIS 540 (FALL) SOFTWARE ENG. PROJECT I
CIS 567 (SPRING) SYSTEMS ANALYSIS for BUSINESS
MATH 205 GENERAL CALC and LINEAR ALGEBRA
CIS 541 (SPRING) SOFTWARE ENG. PROJECT II
ENGL 516 WRITTEN COMM. for the SCIENCES
MATH 312 FINITE APPLICATIONS of MATHEMATICS
TECHNICAL ELECTIVES APPROVED BY ADVISOR 6 HOURS for BA, 12 HOURS for BS

LIST OF COURSES THAT FULFILL DEGREE REQUIREMENTS

AS OF AUGUST, 1989

English Composition I & II
Public Speaking (or Argumentation & Debate)
Principles of Physical Fitness

Humanities: 4 courses 11 hrs. minimum

One course from each of the 4 areas. They may be used at the same time to count toward the major. No course may be used to satisfy more than 1 specific requirement in this section. Only courses taken for 2 or more credit hrs. satisfy these requirements. (Exception: Music-Studio Performance areas 252-799=1+1) (MUSIC LESSONS)

1. FINE ARTS: 1 COURSE
   - Anthropology -- Creativity & Culture 515, Afro-American Music & Culture 517
   - Art technique courses -- 200-799, art history, or Intro. to Museum Studies 305, Computer Imaging Art 400
   - Dance technique courses -- 323, 324, 325, 326, 371, or Dance as an Art Form
   - History of Dance 459
   - * Music courses -- 200, 201, 245, 250, 310, 385, 420, 422, 424, 555, 570, 601, 602, 650, or Studio Perfor. areas 252-799 (MUSIC LESSONS)
   - Theatre courses -- 260-799
2. PHILOSOPHY: 1 COURSE
   Except Logic courses -- 110, 220, & 510 and Comp. Religion 310
3. WESTERN HERITAGE: 1 COURSE
   - American Ethnic Studies -- DAS 160
   - * History courses in Greco-Roman, Western European or No. Amer. Fields
   - Women's Studies -- DAS 105 or 405
   - Humanities (English) Courses -- 230, 231, 233, 234
   - Modern Language Courses -- 514, 530, 565, 566
   - Constitutional Law (Pol. Science) Courses -- 613, 614, 615, 616, 799
   - Music -- Introduction to American Music 245
   - Political Thought (Pol. Science) Courses -- 301, 661, 663, 667, 671, 675, or (Sociology) 709
4. LITERARY OR RHETORICAL ARTS: 1 COURSE
   - * English courses in literature or creative writing 250-799 except 301, 400, 401, 405, 415, 492, 499, 520, 530, 796
   - * Modern Language literature courses including literature in translation
   - Speech -- 330, 335, 430, 432, 434, 460, 725, 730, 732, 733
   - Theatre courses -- 562, 764, 770, 771, 772, 773, 774, 776

BS Degree only: Levels I & II in the same foreign language will satisfy the requirements of 3 & 4.

Social Sciences: 4 courses from 3 disciplines 12 hours minimum.

Up to 2 courses from a single deptartment may be used to fulfill the distribution requirements set forth in this section. They may be used at the same time to count toward the major. One course must be 500-799 level or carry a prerequisite in the same department.

At least 3 of the 4 courses must be from: Psychology, Sociology, Cultural Anthropology, (including Archaelogy), Economics, Political Science, History, Geography (except Environmental I 220 & II 221)

The 4th course must be from 1 of the above or from the following:

Women's Studies -- Intro. 105, Sr. Sem. 405
Gerontology -- Intro. 315, Sr. Sem. 415
Physical Education -- Soc. Dimen. 340, Motor Dev. & Learn. 320, or 435 Sport & Contemp. Society
Speech -- Anal. of Experimental Res. Lit. in Speech 520, Non-Verb. Comm. 323, Perspec. on Comm. 720, Sem. in Persuasion 726, Linguistics except Gen. Phonetics 601, Political Communication 435
Journalism & Mass Communcations -- Intro. to Mass Comm. 235, Women and the Media 612, Minority Press in America 645, Hist. of Journalism 660, Law of Mass Comm. 665, The Mass Communicator: Ethics & Issues 685
Radio-Television -- Hist. of Telecomm. 660 or RTV Crit. 675, Radio-Television and Society 300

Natural Sciences: BS Degree -- 4 courses/14 hr. min.
BA Degree -- 3 courses/11 hr. min.

Courses that fulfill this requirement may be used at the same time to count toward the major. No courses may be used to satisfy more than 1 specific requirement in this section. Only courses taken for 2 or more credit hours satisfy these requirements & courses in excess of 5 credit hours count as 2 courses.

1. A Life Science with Lab
2. A Physical Science with Lab
3. A Life or Physical Science

Life Sciences: Biology, Biochem., Paleobiology (Geol) 581, Paleoecology 704, Intro. Phys. Anthro. 280, 281, Fossil Man & Evol. 688, Primatology 691, Osteology 694, Ost. Lab 695

Physical Sciences: Physics, Chemistry, Envir. Geog. I 220 & II 221 only, Geol. except Paleobiol. 581, Paleoecol. 704

4. BS Degree only: 1 course (3 cr. hr. min.) with a prerequisite in the same dept. chosen from the following: Life or Physical Sci. listed in #3, Biochem. courses with a chem. prerequiste, Phys. Ed.-Kinesiology 330, Physio. of Exercise 335, Psych.-Psychobiology 470, Fund.of Percep. & Sensation 480, Comp. Psych. 616

(OVER)

QUANTITATIVE AND ABSTRACT FORMAL REASONING:

BS DEGREE ONLY

Courses used for this requirement may also satisfy any major requirement for which it qualifies.

Select one of the following three options:

1. Three courses from:
   Math, Statistics, Logic (Philosophy), Computer Science (note: CMPSC 200 requires 201, 202, 206, or 207 and is equivalent to one required course)
2. One of the following pairs:
   - -General Physics I 113 & Trig. 150
   - -Quantitative Analysis in Geog. 700 & Stat. I level course
   - -Methods in Social Research 520 & Stat. I level course
   - -Methods of Social Work Research 519 & Stat. I level course
   - -Intermed. Quantitative Methods 725 & Stat. I level course
   - -Measurement & Evaluation in PE 710 & Stat. I level course
3. Level II: 2 courses
   Math -- Plane Trig. 150; Elem. Applied Math 201, General Calc. & Lin. Algebra 205
   Statistics -- Elem. of Statistics 320, Elem. Statistics for the Social Sciences 330, Biometrics I 340, Business & Econ. Stat. I 350, Stat. Methods for Social Sciences 702, Stat. Methods for Nat. Sciences 703
   Philosophy -- Symbolic Logic II 510
   Computer Science -- Fund. of Comp. Prog. 200 & one of the following: Fortran 201, Basic 206, Pascal 207, Fortran/Engg. 211

--OR--

Level III: 1 course
Math -- Technical Calculus I 210, Analy.Geometry & Calc. I 220, Anal. Geom. & Calc. I-S 225
Statistics -- Biometrics II 341, Business & Econ. Stat. II 351, Analy. of Variance & Covariance 704, Regression & Correlation Analy. 705
Philosophy -- Topics in Metalogic 701
Computer Science -- Algorithmic & Data Structures 300, Comp. Organ. & Prog. IA 305

BA DEGREE ONLY

Foreign Language: 4 courses 15 hrs.
One of the foreign language sequences offered by the Dept. of Modern Languages or equivalent competency.

Mathematics: 1 course 3 hours
100-799 level course offered by the Dept. of Mathematics, or any other course for which there is a mathematical prerequisite. Any course used to satisfy this requirement cannot be used to satisfy any other general education requirement.

INTERNATIONAL OVERLAY:
This course may also satisfy a requirement in the major, social sciences, or humanities. The 4th course in a single foreign language sequence (other than Latin) will satisfy this requirement.

Anthropology -- Intro. Cultural 200, Intro. to Ling. Anthro. 220, Intro. to Archaeology 260, Civ. of South Asia I 505, Civ. of South Asia II 506, Folk Cultures 507, Male & Female 508, Cultural Ecology & Econ. 511, Pol. Organ. in Folk & Nonliterate Cultures 512, Creativity & Culture 515, Afro-Amer. Music & Cult. 517, Black Cultures of the Americas 536, Cultures of India & Pakistan 545, Cultures of Africa 550, Culture & Personality 604, Religion in Culture 618, Music & Culture 616, Indians of No. Amer. 630, Indian Cultures of So. Amer. 634, Precolumbian Civ. of Mexico & Guatamala 673, Archaeology of the Old World 676

Economics -- Civ. of So. Asia I 505, Civ. of So. Asia II 506, Capitalism & Socialism 636, Intern'l Trade 681, Underdeveloped Countries 682

Geography -- World Regional 100, Human Geography 200, Civ. of So. Asia I 505, Civ. of So. Asia II 506, Latin America 620, Europe 640, Soviet Union 650, Geography of Hunger 710, World Population Patterns 715

History -- Russian Cult. & Civ. 250, Gandhi & Indian Revol. 350, Hist. of Hinduism 504, Civ. of So. Asia I 505, Civ. of So. Asia II 506, World War II 514, U.S. & World Affairs 1776-Present 543, U.S. & Soviet Relations since 1917 544, War in 20th Cent. 545, Colonial Hispanic Amer. 561, Mod. Mexico 562, Russian Revol. & Soviet Sys. 564, European Diplo. Hist. to Napoleon 576, European Diplo. Hist. since Napoleon 577, Russia to 1801 591, Grandeur & Decline of Imperial Russia 592, Topics in Non-Western Hist. 598

Journalism & Mass Communications -- International Communications 670

Management -- Intern'l Business (Bus. Adm.) 690

Marketing -- Intern'l Marketing (Bus. Adm.) 544

Modern Languages -- Russian Culture & Civ. 250, Russian Lit. in Translation: 19th Cent. 504, Russian Lit. Translation: Soviet Period 508, Survey Russian Lit. 552

Philosophy -- Comparative Religion 310

Political Science -- World Politics 333, Civ. of So. Asia I 505, Civ. of So. Asia II 506, Contemp. Chinese Pol. 511, Pol. of Dev. Nations 545, Latin Amer. Pol. 622, So. Asian Pol. 623, Mid. East Pol. 624, SE Asian Pol. 625, African Pol. 626, Soviet-Style Regimes 627, Comp. Security Estab. 628, Admin. in Dev. Nations 629, Intern'l Relations 541, Intern'l Conflict 642, Amer. For. Policy 543, Intern'l Pol. Eur. 645, Intern'l Law 647, Intern'l Defense Strag. 649, Intern'l Organ. 651, Intern'l Pol. So. Asia 652, Intern'l Pol. Mid East 653

Sociology -- Civ. of So. Asia I 505, Civ. of So. Asia II 506, Soc. & Change So. Asia

NAME_____ MAJOR_____

ADDRESS_____ DEGREE_____

_____ DATE_____

Courses for Computer Science			Courses for Information Systems		
Anal Geom & Calc I	M220	4	Elem of Statistics	S320	3
Anal Geom & Calc II	M221	4	Intro Business Prog	CIS362	3
Discrete Math	M510	3	Gen Calc & Lin Alg	M205	3
Symbolic Logic I	P220	3	Finite Applications#	M312	3
Prob System Modeling	S410	3	Business Data Prog*	CIS562	3
Theo. Found of Comp.	CIS570	3	Systems Analysis#	CIS567	3
			Written Comm for Sc	E516	3

BS Degree Only

Written Comm for Sc	E516	3
Elem Numerical Anal*	M655	3
or		
Numerical Computing*	CIS580	3

Courses required for BOTH Majors

Fund. of Computer Programming	CIS 200	3
Fund. Language Laboratory	CIS 203	1
Intro. to Computer Engineering	EECE 241	3
Algor. & Data Structures	CIS 300	3
Computer Archit. & Prog.	CIS 350	3
Anal of Algorithms & Data Struct*	CIS 500	3
Intro. to Programming Languages#	CIS 505	3
Operating Systems I*	CIS 520	3
Software Engineering Project I*	CIS 540	3
Software Engineering Project II#	CIS 541	3
Intro to Data Management Systems#	CIS 560	3

* Fall ONLY

\# Spring ONLY

Technical Electives To Be Approved By Advisor:
(6 hrs for BA degree, 9-12 hours for BS degree)

1. _____ ____
2. _____ ____
3. _____ ____
4. _____ ____

Courses for Requirements for Both Degrees

See Current Listing for Courses That Fulfill Requirements

English I	3
English II	3
Oral Communications	2-3
Concepts of PE	1

Courses for BA Degree		Courses for BS Degree	
Humanities (4 Courses)	12	Humanities (4 Courses)	11
1. Fine Arts		1. Fine Arts	
_____	____	_____	____
2. Philosophy		2. Philosophy	
_____	____	_____	____
3. Western Heritage		3. Western Heritage	
_____	____	_____	____
4. Literary or Rhetorical Arts		4. Literary or Rhetorical Arts	
_____	____	_____	____
Social Sciences (4 Courses)	12	Social Sciences (4 Courses)	12
1._____	____	1._____	____
2._____	____	2._____	____
3._____	____	3._____	____
4. Courses must be 500-799 or have prereq. in same dept.		4. Course must be 500-799 or have prereq. in same dept.	
_____	____	_____	____
Natural Sciences (3 Courses)	11	Natural Sciences (4 Courses)	14
1. Life Science w/Lab		1. Life Science w/Lab	
_____	____	_____	____
2. Physical Science w/Lab		2. Physical Science w/Lab	
_____	____	_____	____
3. Life or Physical Science		3. Life or Physical Science	
_____	____	_____	____
		4. Course w/ prereq. in same dept.	
		_____	____
Foreign Languages (4 Courses)	15		
1._____	____	Quantitative requirement	
2._____	____	is met by majoring in	
3._____	____	CMPSC or INSYS	
4._____	____		
Math (1 Course)	3	Internat'l Overlay (1 course)	3
1._____	____	1._____	____

AREAS OF TECHNICAL ELECTIVES 1990

COMPUTER SCIENCE MAJORS

BA select 6 hours, BS select 9 hours as follows:

Courses taken to meet the Computer Science major may not be used as technical electives. Technical electives must be Computing and Information Sciences 300 level and above. One course must be from the CIS 600 or CIS 700 levels.

INFORMATION SYSTEM MAJORS

BA select 6 hours, BS select 12 hours from the suggested coursework for a particular track.

DATABASE MANAGER

CIS 600	Microcomputer Software
CIS 761	Data Base Management Systems
MANGT 420	Management Concepts
MANGT 421	Production/Operations Management
MANGT 466	Management Information Systems

INFORMATION SYSTEMS ANALYST/DESIGNER

CIS 740	Software Engineering
ACCT 211	Financial Accounting
FINAN 450	Business Finance
MANGT 420	Management Concepts
MANGT 466	Management Information Systems
MKTG 400	Marketing

MANAGEMENT INFORMATION SYSTEMS

ACCT 211	Financial Accounting
MKTG 400	Marketing
FINAN 450	Business Finance
MANGT 466	Management Information Systems
CIS 762	Office Automation
PSYCH 560	Industrial Psychology

APPLICATIONS PROGRAMMER

CIS 600	Microcomputer Software
CIS 535	Introduction to Computer-Based Knowledge Systems
CIS 636	Computer Graphics
CIS 740	Software Engineering
CIS 745	Software Development Management

COMMUNICATIONS ANALYST

CIS 600	Microcomputer Software
CIS 750	Advanced Computer Architecture
CIS 762	Office Automation
CIS 725	Computer Networks
PSYCH 425	Problem Solving and Decision Making

GUIDELINES

FOR THE

MASTER OF SCIENCE DEGREE

IN THE

DEPARTMENT OF COMPUTING AND

INFORMATION SCIENCES

KANSAS STATE UNIVERSITY

JANUARY 1989

GRADUATE STUDIES COMMITTEE

Dr. William J. Hankley— Chair
Dr. David A. Schmidt
Dr. Virgil Wallentine

I. INTRODUCTION

These guidelines describe departmental and university requirements for a Master of Science (M.S.) Degree in Computing and Information Sciences. Students are expected to adhere to these standards. If exceptions are warranted, the student must consult the Graduate Studies Committee to determine alternate means of meeting the standards.

The guidelines stated here are those of the Computing and Information Sciences Department. Certain other regulations are imposed by the Kansas State University Graduate School and are described in the "Student Guide for Masters and Doctoral Degrees," available from the Graduate School Office, and in the "Graduate Student Handbook," published by the Graduate Student Council. It is the student's responsibility to know and satisfy all requirements.

The Graduate Studies Committee will keep each student informed of the committee's view of his or her progress towards the M.S. degree. In keeping with this commitment, an annual review of all graduate students is performed each January, and a written evaluation is transmitted to each student.

Graduate students are expected to participate in the professional activities of the Department. This includes attending seminars and colloquia, suggesting improvements in curriculum (both graduate and undergraduate), and suggesting new teaching techniques.

II. ADMISSION

The "Directions for Applying for Graduate Studies in Computer Science" manual gives detailed information about the application process. A student well prepared for graduate study will have a good background in "mainstream computer science." This includes exprience with block structured programming languages (e.g., Pascal), "modular" languages (e.g., Modula, Ada, or Smalltalk), and non-procedural languages (e.g., Lisp, Prolog, or ML), and background in computer architecture or assembly programming, data structures, operating systems, database systems, software engineering, and computing-related mathematics (e.g., mathematical logic, discrete mathematics, or calculus). A student who lacks experience in some of these areas may be asked to do specific coursework to resolve the deficiencies.

III. REQUIREMENTS FOR THE MASTER OF SCIENCE DEGREE

The M.S. degree requires a minimum of 30 credit hours of graduate level coursework; a limited number of credit hours from other accredited graduate programs can be applied. (Note: a student who chooses the "non-thesis-report" Program Option must take 33 credit hours; see Section IIIb.) Each new student is assigned a faculty member to serve as an *Academic Advisor*. The Academic Advisor helps the student select courses and reviews the student's progress until a Major Professor is selected. The coursework must include:

Background Requirement: CMPSC700; this requirement is waived if the student has already taken a course on compiler construction.

Seminar Requirement: CMPSC897. This course is an introduction to the department, general literature in computer science, and technical writing. It must be taken during a student's first year of graduate studies. Based upon the instructor's evaluation of a student's writing skills, the student may be required to take ENGL516.

Implementation Requirement: One of the courses: CMPSC620, 630, 636, 690, or 700. These

courses require the student to complete a substantive software project, including specification, design, testing, and documentation.

Theory Requirement: One of the courses: CMPSC675 or 770. These courses cover formal proof techniques.

Breadth Requirement: Three of the courses: CMPSC671 (specification and verification), 705 (programming languages), 730 (artificial intelligence), 720 (operating systems), 740 (software engineering), or 761 (database systems). (Note: CMPSC762 may be substituted for CMPSC761, and CMPSC725 may be substituted for CMPSC720.) These courses give the student exposure to a breadth of areas in computing. Other courses numbered CMPSC7xx may be used to satisfy this requirement, provided that permission is granted by the Graduate Studies Committee.

Specialization Requirement: One course numbered CMPSC8xx or CMPSC9xx (excluding seminar, projects, and M.S. research courses).

The student must receive a grade of "B" or better for each course used to satisfy the above requirements.

IIIa. Advisor and Supervisory Committee

By the end of the first year as a graduate student, a student must select a *Major Professor.* The Major Professor helps the student choose a *Supervisory Committee,* pick a *Program Option,* and formulate a *Program of Study.* The Supervisory Committee is a group of three faculty members (including the Major Professor) that approves the student's Program of Study and Program Option and gives final approval for the student's degree. The final approval is granted at the *Oral Examination,* which is held when all other requirements are met for the degree. The Oral Examination is described in Section IIIc. The Program Option is described in Section IIIb. The Program of Study lists the courses that the student takes to satisfy the coursework requirements for the M.S. degree. A student must obtain a *Program of Study Form* from the Graduate School, list the courses on it, have the Supervisory Committee sign it, and return it to the Graduate School. The Program of Study Form should be completed at the end of the student's first year of studies.

IIIb. The Program Option

The Program Option can take one of three forms:

Non-thesis-report Option: Write a major paper, for example, as part of a CMPSC8xx course. This option requires 33 credit hours for a M.S. degree.

Report Option: Undertake a project that culminates in a written report; 2 credit hours for CMPSC898 are awarded for the work. Project work satisfying the Implementation Requirement can be used, subject to the approval of the Major Professor. This option requires 30 credit hours for a M.S. degree.

Thesis Option: Perform original research that culminates in a written thesis; 6 credit hours for CMPSC899 can be awarded for the work. This option requires 30 credit hours for a M.S. degree.

The document written to satisfy the Program Option should represent the best possible writing by the student; it is not to be written or extensively edited by the Major Professor. Students should begin their writing early enough so there will be time for review by the Major Professor and rewriting by the student prior to the Oral Examination. Once the student has completed the document, the student must visit the Graduate School and obtain the Graduate School's Approval Form. The Supervisory Committee members sign the Approval Form, and the student returns it to the Graduate School.

If a student chooses either the thesis or report options, the thesis or report must meet the Graduate School's standards. Tentative copies of the thesis or report are due in the Major Professor's office approximately two months prior to graduation. The Graduate School requires three copies of the thesis or report, which are submitted after the Oral Examination.

IIIc. The Oral Examination

Once the Supervisory Committee members have signed the Graduate School's Approval Form, the student returns the form and tells the Graduate School the time, date, and place of the Oral Examination. The examination should take place approximately one month before graduation, and it must occur no sooner than one week after the Approval Form is returned.

The Oral Examination is a presentation of the student's Program Option work and a defense of the student's scholarly effort. The exact format of the Oral Examination is decided by the Supervisory Committee, and the student must consult the Major Professor prior to the examination to establish the format.

A student can either pass or fail the Oral Examination, subject to a vote by the Supervisory Committee. If the student fails, a second attempt of the Oral Examination cannot be retaken in less than two weeks nor more than twelve months after the failed examination, unless an extension is granted by the Dean of the Graduate School. No third try is allowed.

IV. NORMAL PROGRESS

Each semester of enrollment, a student must make ***normal progress*** towards the M.S. degree. Normal progress is considered to be the following:

- a grade point average that is 3.00 or better.
- a Major Professor selected and a Program of Study filed with the Graduate School by the end of the first year in attendance.
- a coursework load of at least 9 credit hours per semester.

V. UNRESOLVED ISSUES

Any issues not covered in this document shall be resolved by the Graduate Studies Committee in consultation with the faculty of the Department of Computing and Information Sciences.

GUIDELINES

FOR THE

DOCTOR OF PHILOSOPHY DEGREE

IN THE

DEPARTMENT OF COMPUTING AND

INFORMATION SCIENCES

KANSAS STATE UNIVERSITY

January 1989

GRADUATE STUDIES COMMITTEE

Dr. William J. Hankley— Chair
Dr. David A. Schmidt
Dr. Virgil Wallentine

1. INTRODUCTION

1a. These guidelines give departmental and university standards for attainment of a Doctor of Philosophy (PhD) Degree in Computing and Information Sciences. You are expected to adhere to these standards. If exceptions are warranted, your advisor and the Graduate Studies Committee must be consulted to determine alternate means of meeting the standards.

1b. The guidelines stated herein are those of the faculty of the Computing and Information Sciences Department at Kansas State University. Certain other regulations are imposed by the Kansas State University Graduate School and are described in the "Student Guide for Masters and Doctoral Degrees," which is available from the Graduate School Office, and in the "Graduate Student Handbook," published by the Graduate Student Council. It is your responsibility to know and satisfy all requirements. 1c. The PhD program in Computing and Information Sciences is offered jointly by Kansas State University in Manhattan and the University of Kansas in Lawrence. Acceptance into the program implies acceptance by both departments. You may elect to fulfill residency and other requirements at either school. You may select courses from offerings at both schools.

2. ADMISSION

2a. In the usual case, you must first complete a Master's degree in computer science or a related field.

2b. You must take the Graduate Record Exam (GRE). Successful applicants have a combined GRE Verbal plus Quantitative score of at least 1200.

2c. If you are an international student and you received your Bachelor's degree abroad, you must take the Test of English as a Foreign Language (TOEFL) and achieve a score of at least 575. (The exam is waived in certain cases, e.g., for an applicant from Canada or Britain.)

2d. You must possess a grade point average of 3.50 (on a scale where an "A" is 4.00) for your Master's level coursework. Your Master's degree work must include material called the *Core Courses*. The Core Courses are:

- -- a compiler construction course
- -- a course in theoretical computer science (formal language theory or analysis of algorithms)
- -- three courses in "breadth areas" (artificial intelligence, database systems, operating systems, programming languages, software engineering, or systems specification)

If your Master's degree studies do not include this material, you may still apply. The Graduate Studies Commmittee may choose to admit you with the requirement that you take specific course material to remedy deficiencies.

3. GENERAL REQUIREMENTS

3a. The PhD degree requires at least 90 semester hours of graduate-level credit, typically distributed as 30 hours of Master's work, 30 hours of PhD level coursework and 30 hours of PhD research, culminating in a PhD dissertation. (See Section 4.1 below.) All work must be completed within seven years. At least one full year must be spent in residence at Kansas State University.

3b. You must maintain a 3.00 grade point average in all coursework.

3c. You must make regular progress toward completion of the degree. Progress of graduate students is reviewed each year in January by the Graduate Studies Committee. A written evaluation is sent to you and placed in your permanent file. Any student who does not maintain an adequate grade point average or who does not respond to a warning of inadequate progress will be placed on probation, with written notice from the Graduate School. A student on probation must correct deficiencies within the time limit indicated in the written notice or be dismissed from the graduate program.

3d. If you are employed by the department, you must enroll in at least 9 hours of graduate-level courses each Fall and Spring term of employment. (Students new to Kansas State University may request to enroll in only 6 hours of courses during their first semester.)

3e. Sometime in your graduate career you must participate in teaching within the Department, either as an assigned instructor or by special arrangement.

3f. You are expected to participate in the professional activities of the Department. You must attend seminars and colloquia offered by the Department and by the professional societies within the Departments.

4. SPECIFIC REQUIREMENTS FOR THE PhD DEGREE

4a. Upon admission to the PhD program, you are assigned an *academic advisor*, who remains your supervisor until you obtain your *major professor* (see Section 4d.). You and your advisor complete a *Declaration of Intent* form and give it to the departmental secretary. You must also consult with your advisor to formulate an initial research paper (see Paragraph 4b), a plan of study and an agreement with a research advisor (see Paragraph 4d).

4b. During your first year in the program, your academic advisor will assign you an *initial research paper* on some topic of the advisor's choosing. The paper you write must display sound organization, clear exposition, evidence of background research, and conceptual understanding of the topic. The paper does not need to be a research proposal or a new research result. The paper might relate to or be supported by a course you are taking. It should represent from 1 to 3 credit hours of work. (In some cases, you can receive CMPSC999 credit for your work.) The paper must not be edited or organized by any member of the faculty.

4c. The initial research paper will be evaluated by your academic advisor in consultation with the Graduate Studies Committee. *You will not be allowed to proceed to the second year of your PhD studies if your initial research paper is not accepted by your academic advisor and the Graduate Studies Committee.*

4d. At the end of your first year of PhD studies, you should seek a *research advisor*, also known as your *major professor*. Your research advisor must be a member of the Graduate Faculty. (See the "Kansas State University General Catalog" for further information.) Since the research advisor organizes and directs your research, you should choose an advisor carefully. How do you find an advisor? Talk to faculty members. Take some of the 800-level or 900-level research-oriented courses. Read current survey and research papers in computer science journals and magazines. *It is your responsibility to obtain a research advisor.* You may not enroll in CMPSC999 (Research in Computer Science) until you have permission of your research advisor to do so.

4e. In consultation with your research advisor, you must compose a *supervisory committee*. The supervisory committee must include three members of the Graduate Faculty in the Computing and

Information Sciences Department. Another member must be from the graduate faculty of the Computer Science Department at the University of Kansas. Another member must be a Kansas State University Graduate Faculty member from a department other than Computing and Information Sciences. All committee members must be chosen for their appropriateness to your planned research topic. In addition, the Graduate School will appoint an examination chairperson from outside of the Computing and Information Sciences Department.

4f. You must consult regularly with your research advisor.

4.1. The Program of Study

4.1a. You must meet with the members of your supervisory committe and formulate a *Program of Study*. (Obtain the Program of Study forms from the Graduate School.)

4.1b. The Program of Study contains the following information:

4.1b.i. major professor (that is, the research advisor)

4.1b.ii. members of the supervisory committee

4.1b.iii. general area of research

4.1b.iv. three preliminary examination areas (See Paragraph 4.2c.)

4.1b.v. all graduate course credits (at least 90 hours)

4.1c. The graduate course credits must include the following:

4.1c.i. The Core Courses stated in Paragraph 2d. Equivalent courses taken at another institution are acceptable. The Graduate Studies Committee reserves the right to determine equivalency. Alternatively, Core Courses can be omitted if you elect to take and pass the comprehensive exam. (See Paragraph 4.2b.)

4.1c.ii. At least 24 hours of course credit at Kansas State University beyond the Master's degree.

4.1c.iii. At least 30 hours of PhD research.

4.1c.iv. At least 9 hours of CMPSC900-level courses.

4.1c.v. One or more courses in theoretical or foundational topics that support your chosen direction of research. The supervisory committee approves the choice of courses for this requirement.

4.1c.vi. Any additional requirements instituted by your supervisory committee. (An example: English 516, "Written Communication for Scientists," is sometimes required for additional writing experience.)

4.2. The Preliminary Exams

4.2a. You must also pass preliminary exams. The exams consist of 4 written exams and one oral exam. *By the end of your second year of studies, you must have passed the preliminary exams.*

4.2b. The first preliminary exam is a *comprehensive exam* over the Core Courses (see Paragraph 2d). *This exam is waived if you complete the Core Courses (either at Kansas State University or at your previous school) with at least a "B" in each course and with a grade point average of 3.50 or greater for all of the courses.* There is no reading list for the comprehensive exam. The exam covers the content of of the core

courses. Syllabi for the Core Courses are available from the department's Graduate Studies secretary. By the end of your second year of studies, you must have passed the comprehensive exam or satisfied the core course requirements.

4.2c. You must pass one exam from each of the following three areas:

Software Systems:
- Compilers & Interpreters,
- Distributed Systems,
- Operating Systems,
- Software Engineering

Knowledge and Information Systems:
- Artificial Intelligence,
- Data Base Systems,
- Office Automation

Theory:
- Analysis of Algorithms,
- Automata & Computability,
- Programming Language Semantics,
- Specification & Verification

4.2d. The exam areas are defined by reading lists. (See paragraph 4.2e.) You must prepare for the topics specified in the reading lists. The general scope of each area will align with a primary graduate course in each area; however, the reading lists will include some items that go beyond the primary graduate course.

4.2e. Preliminary examinations can be scheduled for either September or January. The reading lists will be available from the Graduate Studies Secretary the preceding April 1st or October 1st. You must make a written request to the Graduate Studies Committee by April 15th or October 15th to schedule your exams for the next September or January.

4.2f. The Graduate Studies Committee specifies the exam formats. Usually, the preliminary exams are 4 hours each, scheduled for 3 successive Saturday mornings. (The comprehensive exam is a five hour, closed-book exam.)

4.2g. The preliminary exams are graded by the respective faculty members who prepared them. An exam may be graded as "pass," "fail," or "conditional pass" subject to further work. If exactly one of the three exams is graded "fail," you must retake and pass that exam the next time that exams are offered. If two or more of the exams are graded "fail," you must retake and pass exams in the same three areas the next time that exams are offered. You are allowed only one retake of an exam. If you fail an exam twice, you must leave the PhD program. (The comprehensive exam can be retaken only once. If the comprehensive exam is failed twice, you must leave the PhD program.)

4.2h. The final phase of the preliminary exams is the oral exam. The oral exam occurs about a month after your written exams are graded. The format of the oral exam is set by your supervisory committee. The oral exam might cover questions of general knowledge in computer science, specific questions from your written exams, or topics in your field of research. The result of your oral exam is decided by the supervisory committee, who can vote "pass" or "fail." The committee may also decide that you must retake the oral exam a second time. You must pass the oral exam by the second try, or you must leave the PhD program.

4.2i. The Graduate School must be informed of the outcome of the preliminary exams. When you have completed two-thirds of your PhD coursework and have taken (or will soon take) your preliminary exams,

ask the Graduate School to issue the ballot for the preliminary exams. The Graduate School will send the ballot to the Department, which then reports the results to the Graduate School. Upon passing the preliminary examinations you are admitted to *candidacy for the PhD degree*.

4.3. The Dissertation Research

4.3a. Once you pass the preliminary exams, you must write a *research proposal* of your dissertation research. Your proposal must present background concepts and literature, it should define the topic and goal of your research, and it should identify how you will evaluate successful completion of the goal. You must meet with your supervisory committee and present your proposal. The committee must approve your proposal.

4.3b. You must work closely with your advisor on your research, and you must write a *dissertation*.

4.3c. You must successfully defend your dissertation, subject to the following conditions:

4.3c.i. You must have been a candidate for the PhD degree for at least seven months.

4.3c.ii. You must obtain a dissertation approval form from the Graduate School. You must give each member of the supervisory committee, including the appointed Chairperson of your final examination, a copy of your dissertation and have each member sign the form.

4.3c.iii. You must allow the committee at least two weeks to read your dissertation prior to your final examination. (See Paragraph 4.3c.iv.)

4.3c.iv. You must schedule your oral presentation and defense of your dissertation (also called the *final examination*) with the Graduate School. (After you give the Graduate School the signed dissertation approval form, they will issue a ballot to the Chairperson of your final exam.)

4.3c.v. You must arrange with the Department secretary to to schedule a room and to make public announcement of the time, place, and title of your presentation.

4.3c.vi. You must present the dissertion to your supervisory committee in an open seminar, and the committee votes to "pass" the dissertation. If the committee votes to "fail," then you are allowed one retake of the defense.

4.3c.vii. If you pass the defense, you must submit the required dissertation copies, fees, and address information to the Graduate School.

4.3d. Finally, you must submit for publication at least one paper based upon your research. You must present the paper to the Computing and Information Sciences Department in an open seminar.

5. Unresolved Issues

5a. Any issues not covered in this document will be resolved by the Graduate Studies Committtee and the Computing and Information Sciences Faculty.

Appendix 4

Teaching Assignments

Calendar Year 1989 Faculty and Graduate Teaching Assistant Assignments

I. Faculty Assignments and GTA Graders

A. Professor, Associate Professor, and Assistant Professor

	Teaching Assignment		Graduate Teaching Assistant
	Spring 1989	Fall 1989	
Virg Wallentine	CMPSC 690	CMPSC 690	Jim Butler
Bill Hankley	CMPSC 505(2)	CMPSC 636 CMPSC 671	Qian Huang (spring) Raghavendra Rao (fall)
Elizabeth Unger	CMPSC 560(2) CMPSC 990	CMPSC 761 CMPSC 762	Dennis Ng Sheela Ramanna
Myron Calhoun	CMPSC 305 CMPSC 362	CMPSC 305 CMPSC 362 CMPSC 580	Doug Varney (spring) Peikun Tsai Ramesh Tiwari
David Gustafson	CMPSC 541 CMPSC 740 CMPSC 940	CMPSC 535 CMPSC 540	Richard Courtney Kyung He An (spring) Eric Byrne
Dave Schmidt	CMPSC 806 CMPSC 990	CMPSC 700 CMPSC 705	Kyung Doh Pascal Fradet
Maarten vanSwaay	CMPSC 307 CMPSC 492 CMPSC 520	CMPSC 500(2) CMPSC 520	Tom Supawarnnapong (spring) Ganesan Sundar (spring) A. Banerjee (fall) Kasinath Vemulapalli (fall)
Maria Bleyberg	CMPSC 730	CMPSC 630	Rizwan Mithani (spring) Cindy Cook (fall)
Rodney Howell	CMPSC 675 CMPSC 990	CMPSC 770	Adrian Fiech
Masaaki Mizuno	CMPSC 620 CMPSC 725	CMPSC 920	Sudeep Dharan (spring)
K. Ravindran		CMPSC 825	S. Ramakrishnan (grant)

B. Instructor and Instructor-Temp.

	Teaching Assignment Spring 1989	Fall 1989	Graduate Teaching Assistant
Joseph Campbell	CMPSC 567 CMPSC 897	CMPSC 562 CMPSC 897	
Charles Kichler	CMPSC 110	CMPSC 110	
James Peters	CMPSC 370 CMPSC 591		
Clark Sexton	CMPSC 200 CMPSC 207	CMPSC 200 CMPSC 207	Li Fang Hsieh (spring) Eric Fong (fall)
Kole Scarbrough			Mini Supercomputer Admin

II. GTA Assigned as Classroom Teachers

Greg Knittel	CMPSC 110 (spring)
Kiang Pang	CMPSC 110
Jim Slack	CMPSC 200
David Balda	CMPSC 206 (spring)
Gary Wade	CMPSC 206 (spring)
Charles Black	CMPSC 206 (fall)
Ka Wing Wong	CMPSC 207
Hossein Saiedian	CMPSC 211 (spring)
Stan Robben	CMPSC 211 (spring)
Abdul Kasim	CMPSC 211 (fall)
Kevin Lynn	CMPSC 211 (fall)
Mohammad Paryavi	CMPSC 300
Mitchell Neilsen	CMPSC 370 (fall)
Paul Connelly	CMPSC 490 (fall)

III. Miscellaneous GTA Assignments

David Balda (fall,grd 20X)	Jeff Brogden (fall,systems)
Kok Hui Chong (spring,grd 20X)	Eric Fong (fall,grd 207)
Don Hager (spring,systems)	Amit Halder (grd 110)
Steve Hansen (coordinate 20X)	JR Hockersmith (fall,systems)
Abdul Kasim (spring,grd 20X)	Greg Knittel (fall,grd 110)
Janaki Krishnaswamy (grd 110)	Chris Li (spring,systems)
David Liu (fall,grd 20X)M.	Nelakonda (fall,grd 110)
James Peters (fall,grd 300)	Peter Prakash (spring,grd 110;fall systems)
Raghavendra Rao (spring,systems)	Paul Root (spring,systems)
S. Samdarshi (fall,grd 110)	Kole Scarbrough (spring,grd 725)
M. Venkatrao (fall,grd 110)	Kevin Weinhold (spring,grd 110)

Appendix 5

Committee Service

Maria Zamfir-Bleyberg

Recruiting Committee

Myron Calhoun

The "Service Courses" subcommittee of the "Undergraduate Studies" committee.

David Gustafson

Seminar committee
Undergraduate Studies
Faculty Evaluation
Faculty Search

William Hankley

Graduate Studies Committee
converting databases to Mac Excel screening of applicants manage prelim exams
Undergraduate Studies Committee
manage 2 yr curriculum & catalog changes College Laboratory Committee manage Mac lab spec & purchases

Rod Howell

Seminar Series Committee
Undergraduate Studies Committee - in charge of CIS 370 (570).

Austin Melton

None

Masaaki Mizuno

Faculty Recruiting Committee
Computing Facilities

K. Ravidran

None

David Schmidt

Graduate Studies Committee

Elizabeth Unger

A & S Deans Advisory Committee
Undergraduate Studies, Chair until August
Chair, Search Committee for KSU Vice Provost

Maarten van Swaay

UG curriculm

Virgil Wallentine

CIS Department

- Chair, Recruiting Committee
- Chair, Computing Facilities
- Faculty Evaluation
- Graduate Studies

A&S College

- Chair, College Committee on Planning
- Faculty Evaluation
- Chair, General Laboratory Committee

KSU

- Academic Computing Advisory Committee
  - -- Subcommittees
    - --- Co-chair, Ethics
    - --- Planning
    - --- Networking
- Telecommunications
  - -- Executive Council

Appendix 6
PUBLICATIONS

Accepted for Publication

Bleyberg, M., "AND/OR Algebraic Theories" (draft paper) presented at the 5th Workshop on the Mathematical Foundations of Programming Languages Semantics, Tulane University, March 1989.

Cabrera, M., and E. Unger, "Dynamic Data as a Deterrent to the Tracker," ACM SIGSMALL/PC 1990 Symposium.

Cheng, S., and V. Wallentine, "DEBL: A Knowledge-Based Language for Specifying and Debugging Distributed Programs. Presented at 1989 Computer Science Conference. Also appears in Communications of the ACM Vol. 32, No. 9, Sept, 1989.

Even, S. and D. Schmidt. ''Category Sorted Algebra-Based Action Semantics''. accepted for publication, Theoretical Computer Science.

Even, S. and D. Schmidt. ''Category Sorted Algebra-Based Action Semantics (extended abstract)''. Proc. Conf. on Algebraic Methodology and Software Technology, Iowa City, May 1989. acceptance rate about 20%

Even, S. and D. Schmidt. ''Type Inference for Action Semantics'' Submitted to 1990 European Symposium on Programming.

Even, S. and D. Schmidt. ''Category-Sorted Algebra Based Action Semantics'' Report TR-CS-89-9 Accepted by TCS as noted above.

Hansen, S. and E. A. Unger, " A Model for Computer Organisms", ACM/IEEE WAC 1989.

Haycock, A., and E. Unger, "Conflict free Multivalued Dependencies: A Guide to their Properties and Contibution to Database Schema Improvement," ACM South Central Regioanal Conference Proceedings, 1989.

Hines, M. and E. Unger, "OODB: an Overivew and Proposal for Exception Handling," ACM/IEEE WAC Proceedings, 1989.

Hines, M. and E. A. Unger, "A Conceptual Objected Oriented Database", ACM/IEEE WAC 1989.

Hines, T. and E. A. Unger, " Learning Lines of Codes Software Estimation by Example"' ACM/IEEE WAC 1989.

Howell, R., and L. Rosier, "Problems Concerning Fairness and Temporal Logic for Conflict-Free Petri Nets, Theoretical Computer Science 64 (1989), pp. 305-329.

Howell, R., Rosier, L., and H. Yen, "Normal and Sinkless Petri Nets", in the Proceedings of the 7th International Conference on Fundamentals of Computation Theory, LNCS 380, pp. 234-243, Szeged, Hungary, August 1989.

Howell, R., Rosier, L., and M. Gouda, "System Simulation and the Sensitivity of Self-Stabilization" in the Proceedings of the 14th International Symposium on Mathematical Foundations of Computer Science, LNCS 379, pp. 249-258, Porabka Kozubnik, Poland, August- September 1989.

Isenhour, T., Marshal, J.C., Zhou, T., and M. Bleyberg, "The Design and Implementation of an Analytical Chemistry Expert System" , 3rd International Conference on AI Applications in Engineering.

Lass, D. and D. Schmidt. ''Single-Threaded Combinator Definitions'' Report TR-CS-89-8 Submitted to Functional Prog. Lang. and Computer Architectures Conf.

McBride, R. A., K.W. Wong, J.F. Peters and E.A. Unger, "Rule Based Active Message Systems"., ACM/IEEE WAC March 1989.

McNulty, S., and E. Unger, "Information Disclosure and Data Aggregation", Interface Orlando 1989.

Melton, A., Shenoi, S., and L.T. Fan, "Functional Dependencies and Normal Forms in the Fuzzy Relational Database Model", Information Sciences.

Melton, A., and N. Fenton, "Deriving Software Measures Throughout the Development Process", The Journal of Systems and Software.

Melton, A., Baker, A., Bieman, J., Fenton, N., Gustafson, D., and R. Whitty. "A Philosophy and Goals of Software Measurement", The Journal of Systems and Software.

Mizuno, M., "A Least Fixed Point Approach to Inter-Procedural Information Flow Control" in Proc. of 12th National Computer Security Conference, 1989.

Mizuno, M., "An Iterative Method for Secure Inter-Procedural Information Flow Control" in Proc. of COMPSAC89, pp286-291, 1989.

Mizuno, M. and G. Sundar, "Distributed Algorithms for Multiple Mutual Exclusion based on Maekawa's sqrt(N) algorithm (EXTENDED ABSTRACT)" to appear in Proc. of International Phenix Conference on Computers and Communication, 1990.

Ramanna, S., Peters, J., and E. Unger, "Logic of Knowledge and Belief in The Design of a Distributed Integrity Kernel," Parabase-90 International Conference on Database, Parallel Architectures and their applications, 1990. Acceptance Rate 31%

Ravindran, K. and S. T. Chanson, "Failure Transparency in Remote Procedure Calls". IEEE Transactions on Computers, Vol. 38, No. 8, pp. 1173-1187, Aug. 89.

Ravindran, K. and S. T. Chanson and K. K. Ramakrishnan, "Reliable Client-Server Communication in Distributed Programs". 14th Conference on Local Computer Networks, Oct. 89.

Saiedian, H. and E. A. Unger, "An Actor Based Specification Language for Office Automation," ACM Computer Science Conference, 1989.

Saiedian, H., and E. Unger, "Formal Specification Tool for Distributed Office Systems," ACM SIGSMALL/PC Symposium 1990. Acceptance Rate 46%.

Saiedian, H., and E. Unger, "Design Principles of a Specification Methodology for Office Systems," ACM/IEEE SIGSMALL WAC Proceedings 1989.

Unger E. A., Samuel Hsieh, Maarten van Swaay, "A Concurrency Method: Prototype Implementation", ACM/IEEE WAC 1989.

van Swaay, M., and M. Lucas, "Resource Materials for a Process Control Laboratory, IEEE Educational Activities Board, 1989 "Measurement of Interrupt Response Time", IEEE 1989.

Vaughn, Rayford and Elizabeth A. Unger, "A Multilevel Approach to LAN_WAN Security," Proceedings of the Department of Energy Conference on Security, 1989.

Wong, K., and E. Unger, "Formal Analysis of Active Messages," ACM South Central Regional Conference Proceedings, 1989.

Wong, K. W. and E. A. Unger, "An Architecture for Active Messages Systems", ACM/ICCC WAC 1989.

Submissions

Bleyberg, M.,"On the Semantics of Petri Nets" submitted to the 5th Annual IEEE Symposium on Logic in Computer Science.

Bleyberg, M., "A Categorical View of Databases" submitted to ICALP 90.

Even, S. and D. Schmidt. ''Type Inference for Action Semantics'' Submitted to 1990 European Symposium on Programming.

Gustafson, D., Toledo, R., Courtney, R., and N. Temsamani, "A Critique of Validation/Verification Techniques for Software Development Measures".

Hagemann, C. and E.A. Unger, Lan: Small Group Decision Support System: Integration of Fuzzy Sets Teory in Multilevel Decision making, Submitted to the Decision Support Journal of the American Management Association.

Hagemann, C. and E. A.Unger, LAN SGDDS: Assisting in Semi-Structured Multilevel Decision Making Situations, Submitted to Decision Support Journal.

Howell, R., Rosier, L., and H. Yen, "A Taxonomy of Fairness and Temporal Logic Problems for Petri Nets" accepted for publication in Theoretical Computer Science.

Howell, R., Rosier, L., and H. Yen, "Global and Local Views of State Fairness" accepted for publication in Theoretical Computer Science.

Howell, R., Rosier, L. and M. Gouda,"The Instability of Self-Stabilization", submitted to Acta Informatica.

Howell, R., Rosier, L., and H. Yen, "Normal and Sinkless Petri Nets", submitted to Journal of Computer and System Sciences.

Hsieh, S., and E. Unger, "Information Flow Control: An Observational View, submitted to COMPASS 90.

Huang, Q., and D. Gustafson, "Evaluation of Data FLow Diagrams based on Fuzzy Sets". Submitted to the ACM South Central Regional Conference.

Liu, Y., and Wong, K. and E. Unger, "Active Message as a Model to Implement Office Procedures," submitted to ACM/IEEE WAC90.

Mata, R., and D. Gustafson, "A Factor Analysis of Complexity Measures". This is based on Ramon thesis. Submitted to Journal of Systems and Software in Sept 1989.

McNulty, S., McNulty, M., and D. Gustafson, "Stochastic Models for Software Science". Submitted to Journal of Systems and Software (Apr 89).

Melton, A., Gustafson, D., Bieman, J., and Albert Baker, "A Mathematical Perspective for Software Measures Research". Submitted to British Computer Society's Software Engineering Journal (Sept 89).

Melton, A., Baker, A., Bieman, J., and D. Gustafson. "A Mathematical Perspective for Software Measures Research", submitted to IEE Software Engineering Journal.

Melton, A., Shenoi, S., and L.T. Fan, "An Equivalent-Class Model of Fuzzy Relational Databases," The International Journal of Fuzzy Sets and Systems.

Mithani, R., and E. Unger, "An Object Oriented Environment for Distributed Database Systems,' submitted to OOPSLA.

Mizuno, M., and G. Sundar, "Distributed Algorithms for AND-Synchronization based on Maekawa's sprt(N) algorithm", submitted to IEEE Transactions on Parallel and Distributed Computing.

Mizuno, M., and M. Neilsen, "A Dag-Based Algorithm for Distributed Mutual Exclusion", submitted to ACM TOCS.

Mizuno, M. and R. Rao, "A Token Based Distributed Mutual Exclusion Algorithm based on sqrt(N) topology", submitted to IEEE Transactions on Computers.

Perng, J. and E. Unger, "User Friendly Front End fro an MPS Program," submitted to ACM/IEEE Symposium on Applied Computing 1990.

Peters, J., and W. Hankley, "Temporal Specification of Ada Tasks", for Jan 1990 Hawaii Conf on System Sciences.

Peters, J., and W. Hankley, "A Proof Method for Ada/TL Specifications", for March 1990, 8th Conf on Ada Technology, Washington, DC.

Ramanna, S., Peters, J. and E. Unger, "Temporal Specification of Integrity Kernels for Office Systems," submitted to ACM-SIGOS/IEEE COIS90 Conference on Office Information Systems.

Ramanna, S., and E. Unger, "Logic of Knowledge and Belief in the Design of a Office Information System Integrity Kernel," submitted to the International Office Systems Conference.

Ranft, S., and D. Gustafson, "Evaluating Projects with the Software Process Model". Submitted to CompSac 90.

Ravindran, K., "Fine-Grained Dynamic Reconfiguation of Servers in Distributed Operating Systems". Submitted for publication in IEEE Trasactions on Parallel and Distributed Computing, October 1989.

Ravindran, K., "Tradeoffs Between Complexity and Efieciency of Distributed Application Protocols". Submitted for publication in IEEE Transactions on Computers, January 1990.

Ravindran, K., "Evaluation of Reliability of Remote Procedure Calls in Distributed Programs". Submitted for publication in IEEE Transactions on Reliablity, February 1990.

Unger, E. A. , Sallie Keller-McNulty, and Nanda Kaushik,"An Economical Deterrent to Compromise of a Statistical Database', prepared for the NIST/NCSC Conference.

Varney, D., and E. Unger, "Malicious Code Detection using Attribute Grammars prepared for submission to the NIST/NCSC Security and Integrity conference.

Vaughn, R. and E. A. Unger, "A Security Architecture for Office Information Systems", submitted to ACM TOOIS Nov 1989.

In Progress

Al-Ali, K., and David A. Gustafson, "A Mathematical Foundation for Testability".

Bleyberg, M., and C. Cook, "CER* - An Object-Oriented Database Management System Prototype" TR-CS-89-15.

Butler, J. and V. Wallentine, " Vignettes: A Visual Queuing Network Simulation Language".

Butler, J. and V. Wallentine, "Load Equalization in Time-Ways Simulation". Gustafson, D., and Austin C. Melton, "Change Analysis for the Management of Software Development and Maintenance".

Gustafson, D., Al-Ali, K., An, K., Byrne, E., and A. Haycock, "Testing Strategies based on Reduced Paths".

Gustafson, D., "A Philosophy and Goals for Software Measurement".

Gustafson, D., CIS TR 89-02 is "A Critique of Validation/Verification Techniques for Software Development Measures"

Howell, R., Baruah, S., and L. Rosier, "On Preemptive Scheduling of Periodic, Real-Time Tasks on One Processor" in preparation.

Howell, R., Gouda, M. and L. Rosier, "The Instability of Self-Stabilization", Technical Report TR-CS-89-3, Dept. of Computing and Information Sciences, Kansas State University.

Huang, Q., and David A. Gustafson, "A Formal Notation for Data Flow Diagrams".

Lass, D., and D. Schmidt. ''Single-Threaded Combinator Definitions'' Report TR-CS-89-8.

Melton, A., Strecker, G., and P. Sestoft, "Lagois Connections and Computer Science Applications", Acta Informatica or Theoretical Computer Science.

Melton, A., and H. Dybkjaer, "Lambda Calculus, Hagino's Categorical Language, and Martin-Lof's Type Theory", Theoretical Computer Science.

Melton, A., and S. Shenoi. "The Role of Contexts in Abstract Information Storage and Retrieval".

Melton, A., and S. Shenoi. "Restricted Domain Partitioning". IEEE Trans. on Data and Knowledge Engineering or IEEE Trans. on Systems, Man, and Cybernetics.

Melton, A., "Topological Spaces for Cpos, Lecture Notes in Computer Science", 393, Springer-Verlag, 1989, pp. 302-314.

Mizuno, M., Neilsen, M. and K. Pang, "A Generalized Token Based Distributed Mutual Exclusion Algorithms for AND-Synchronization", in progress.

Mizuno, M. and A. Oldehoeft, "Information Flow Control for modular programming systems", preparing for the second submission to ACM TOPLAS (or some other journal).

Unger, E., "Semantic Modelling as an Approach to the Data Aggregation Problem," in preparation for the National Security Conference.

Appendix 7

Grants/Proposal

Awarded/Active

Maria Zamfir-Bleyberg

National Science Foundation Grant ($281,000) funded for "ANALYTICAL DIRECTOR - An Artificial Intelligence/Robotic Expert System for the Analytical Laboratory", with Professor Isenhour (principal investigator).

A KSU CRCCA ($20,000) grant to purchase KEE and develop an object-oriented database prototype based on my theoretical results.

A KSU CRCCA ($6,000) grant to investigate concurrency control in database systems.

A KSU CRCCA ($1,200) grant to take a course on neural nets at UCLA extension.

David Gustafson and Austin Melton

NATO Travel Grant 0343/88 ($6,000) "Formal Foundations of Software Measurement". NATO Collaborative Research Grant 034/88 expired this year. Applied for a one year extension for travel to two research meetings for the Grubstake Group.

Austin Melton

ONR Grant N00014-88-K-0455 running through Sept 91 ($225,963)

Masaaki Mizuno

The Center for Research and Computer Controlled Automation #FY89N003, funded for Summer, 1989. ($346)

The Center for Research and Computer Controlled Automation #90NO18, with Dr. K. Ravindran. ($8,484.00)

Listed as a senior associate in proposal "Semantics-Driven Compiler Synthesis" (NFS May 1, 1989 - April 30, 1991) by Dr. David A. Schmidt.

K. Ravindran

Obtained seed funding from "CRCCA" for research on multiservice ISDN's. ($8,484.00)

David Schmidt

'Semantics-Directed Compiler Synthesis', NSF, $158,000, 2 years.

Virgil Wallentine

'AT&T Summer-on-Campus' Graduate Program ($162,864).

SCS-40 Super mini-computer to support Parallel Computing Research ($700,000).

Pending

K. Ravindran

'A Data-Driven Communications Architecture for Distributed Operating Systems', $70,000, NSF.

Elizabeth Unger

NCSC Data Security Grant ranked to #2 behind Carnegie-Mellon Talked to them Dec 20 and they still think we will be funded in early 1990. They had appropriations pulled form their grant program so no grants have been funded since October.

Appendix 8

Current Research Programs of the CIS Faculty

Research in this department can be categorized in five basic areas - programming languages, software engineering, knowledge engineering, data base systems, and parallel and distributed systems. In this section we list the current specifc research projects of the CIS faculty.

Maria Zamfir, Ph.D., UCLA. Her research interests include different but interacting areas: the initial algebra semantics of parallel distributed computing, neural networks, and formal semantic models for the design of databases and knowledge-based systems.

In the area of parallel computing, her goal is to develop a language for writing and testing formal specifications of parallel distributed systems based on the AND/OR net model. The AND/OR net model is an initial algebra semantics model for concurrent computing systems, which I have been working at for the past few years. I have also been examining Petri nets as object-oriented systems in which abstract data types provide values for attributes. I have been using this view of Petri nets to define an abstract operational semantics for them based on "reflection". Finally, I hope that the study of neural networks will open new directions in my research in the area of parallel computing.

Regarding databases and knowledge-based systems, she is interested in building practical systems with appropriate logical foundations. At present, she is involved in the design and implementation of an expert system that can design and simulate an analytical chemistry procedure and controls the robot during the procedure execution. Regarding databases, she has been working at the implementation of an object-oriented database. This implementation is based on a formal categorical model of databases, which I have developed.

Myron A. Calhoun, Ph.D., Arizona State. Trying to delve deeply into the uses of Finite Inductive Sequences (FIS) as described by Fisher & Case. FIS appears to be directly applicable to the compression of textual data as well as compressing, processing, and recognizing visual images; this latter may also include applications in mobile free-ranging robotics. His ongoing (but now mostly backgróund) research emphasizes the application of computers to real-world problems such as the development of computer interfaces for the handicapped and low-cost packet-radio networks."

David A. Gustafson, Ph.D., Wisconsin-Madison. His research interests are in the area of software engineering. He is formalizing the theory of software measures so that it becomes obvious what is being measured and what propoerties the measure has. He is also doing research into the problems of validating software measures. Another area of research is software reliability. He is currently investigating models of the software structure that can be used to develop a software reliability model. Related to the area of reliability is the area of software testing methods. He is developing more thorough test methods that have formal bases. Another area in which he is involved is the area of formal notations for diagrams, both data flow diagrams and hierarchy diagrams. The creation of better notations will allow more formal work on transformations of the diagrams. Finally, he is working on developing notations for describing the software development process in terms of the documents that are produced.

Rodney Howell, PhD, University of Texas at Austin. His research interests lie mainly in three areas: real-time scheduling, self-stabilization, and Petri nets. In the area of real-time scheduling, he has been looking at the complexity of finding valid schedules for various types of periodic real-time systems. In many cases, the problems turn out to be NP-hard. His goal is to identify as many situations as possible in which schedules can be constructed efficiently. Regarding self-stabilization, he is interested in examining various theoretical limitations for self-stabilizing systems. For example, he has

recently explored situations in which certain types of models cannot simulate other types of models while preserving self-stabilization. Finally, in the area of Petri nets, he has been examining the computational complexity of various problems, such as reachability, boundedness, equivalence, liveness, and fair nontermination, for different classes of Petri nets. His main goal in this area of research is to tighten the known bounds on the complexity of the reachability problem for Petri nets.

William J. Hankley, Ph.D., Ohio State University. His research centers on formal specification of programs. Writing formal specifications is a kind of programming; it is the use of very high level nonprocedural languages. The research focus is on object-oriented and modular structure (using ADA concepts), high level data types (sets, maps, sequences as in VDM), logic specifications (predicate calculus and Prolog notations), and temporal description of task behaviors (temporal logic). Related work includes formal verification of specified system properties, development of executable specifications as program prototypes, and use of direct manipulation interfaces for rapid development of prototypes.

Austin Melton, Ph.D., Kansas State University. His research interests include programming semantics, software engineering, and nonnormal form relational databases. In programming semantics he is interested in using category theory to understand and explain programming semantics, and further he is interested in seeing how category theory itself can be used as a programming language. In software engineering he works with software measures or metrics. His work involves trying to develop a foundation upon which one can with confidence design and define useful software measures. In databases he is working to define a general method for defining and studying non-normal forms structures.

Masaaki Mizuno, Ph.D., Iowa State University. Research interests are in computer security and various aspects of distributed systems. He has worked on an information flow control mechanism for modular programming systems. He also works with Dr. David A. Schmidt on theoretical aspects of information flow by applying methodology in programming semantics. In his research in distributed systems, he and his students have developed efficient distributed mutual exclusion algorithms and distributed AND-synchronization algorithms. Currently, his group is studying concurrency control and recovery issues of transaction based distributed database systems.

K. Ravindran, Ph.D., British Columbia. Currently pursuing research on distributed systems architectures and high speed packet networks. Specific areas being investigated are: (i) Data-driven communication in distributed operating systems to allow fine-grained reconfigurability of services and fine-grained parallelism among functions that compose a server; (ii) Design of a flexible communication kernel for distributed applications whereby different applications may choose different forms of communication mechanisms to suit their requirements; (iii) Network architectures and protocols to handle congestion control, bandwidth management and packet multicasting in high speed packet switching.

David Schmidt, Ph.D., Pursuing research on the theory of programming languages as it is expressed within denotational semantics. He uses denotational semantics to analyze the structure of programming languages and to implement them. In past research, he has shown how to synthesize efficient implementation data structures for languages defined by denotational semantics. He and a research student are building a "rapid prototying," compiler synthesis system based on these ideas.

Recently, he has studied the category-theoretic foundations of languages with polymorphic operators within a denotational semantics variant called "action semantics." He and a student have developed a sound and complete type inference algorithm for action semantics; the algorithm is being implemented as part of a programming language analysis "workbench."

Elizabeth Unger, Ph.D., University of Kansas. The entire thrust of her research program is in the development of security and integrity systems based upon the object oriented programming paradigm. The

work proceeds with two foci: description of the general inference problem and characterization of the database administrator and user level integrity constraints. The first thrust includes the completion and documentation of the value of natural change for deterrent value on the tracker attacks; the mathematical and statistical characterization of the security value of such change; the security value of change in conjunction with other deterrent methods; the characterization of information increment given a user data increment. This latter characterization is just beginning with Shannon's concept of entropy as the basis for measurement. Such a measure will allow the use of a semantic model to characterize statistically the security risk of releasing data in certain risk environments. The second thrust is concerned with the formal description of one aspect of user level integrity, the temporality. In this thrust, a next step is the clear definition of user level integrity, the specification of a language in which to spedify contraints (to be used in the security project also) and the definition of the architecture of such a system within contemporary operating systems.

Maarten van Swaay, Ph.D., Leiden (Netherlands). Interests in laboratory instrumentation and in neural network systems. He has written a chapter on laboratory computing for a handbook on chemical instrumentation; the book is scheduled for publication in March 1990. In addition to technical areas Dr. van Swaay has a strong interest in social and ethical issues of computing, and has developed a course in that area in our department.

Virgil Wallentine, Ph.D., Iowa State University. Research includes distributed systems and their applications. More specifically, his work centers on what can be distributed, how it can be distributed across multiple processing units, and what properties of the system make it amenable to distribution. Presently, he is working in the area of Parallel and Distributed Discrete Event Simulation and in methods for debugging distributed programs. Several specific projects are on-going including the construction of a system which supports a visual programming facility for queueing networks, a performance prediction environment for DDES, and a knowledge-based debugging system for distributed programs.

Appendix 9

Professional Service

Maria Zamfir-Bleyberg

Refereeing for TCS (AMAST special issue):
"Higher-Order Polymorphic Equational Deduction with Function Constraints" by Zhenyu Qian

Refereeing for IEEE, TSE:
"Deriving Temporal Logic Formulae from Predicate Transition Nets" by X. He and J. A. N. Lee.

Refereeing for NSF (Division of Information, Robotics, and Intelligent Systems):
"Grammar and Relations" by Leo Mark.

Reviewing for AMAST:
"Constructor Models as Abstract Data Types (ADTs)" by Hantao Zhang
"An Extension to the Algebraic Specification Mechanism for ADTs by Hassan Mathkour
"An Algebraic Approach for Knowledge Integration" by Z. Chen
"Algebraic Structure of Petri Nets and Nondeterminism" by David B. Benson, Raju R. Iyer
"OBJSA Nets: OBJ2 and Petri nets for Specifying Concurrent Systems" by E. Battiston, F. DeCindio, G. Mauri
"Algebraic Specifications of ADTs and the Assessment of Ultra-Reliability" by Keith Miller, Robert Noonan, Steve Park
"An Algebraic Structure for Development of AI Systems" by Rong Lin
"An Image Processing Software Development: A Polynomial Algebra Approach" by Prabir Bhattacharya, Kai Qian
"An Example of IDAL Specifications" by Magne Haveraaen
"Formal Semantics of Two-tiered Specifications" by David Guaspari
"The Verification of Algebraically Specified Abstract Data Types using Higher -Order logic" by Phillip J. Windley

Myron Calhoun

Chairman of the "PC Applications for Developing Nations" sub- committee of TC/PC, the IEEE Technical Committee on Personal Computers.

David Gustafson

Refereed for the following:
IEEE Software - special issue on SLC Measures
IEEE Software - special issue on Software Maintenance
Conf on Software Maintenance 1989
ACM South Central Regional Conference
Hawaii Inter Conf on System Sciences

William Hankley

Reviewer for ACM Computing Reviews
Reviewer for Hawaii System Sciences Conference
Reviewer for IEEE Trans Soft Engr

Rod Howell

Refereed for Real-Time Systems and Fundamenta Informaticae.

Austin Melton

Referee for:
- IEEE Software Engineering Journal
- Mathematical Foundation of Programming Semantics Workshop

Masaaki Mizuno

Referee for:
- IEEE Computer
- ACM Simposium on Personal and Small Computers

K. Ravidran

Refereed papers for:
- IEEE Computer
- IEEE Trans on Computers
- IEEE Conference on Fault-Tolerant Computing

David Schmidt

Refereeing:
- Algebraic Methodology Conf.
- ACM TOPLAS
- Intl. J. of Parallel Programming
- 1989 IFIP World Computer Congress
- NSF
- Tenure review for NC Charlotte
- Theoretical Computer Science

Elizabeth Unger

Reviewer for:
- ACM CSE 1989
- ACM CSC 1989
- ACM Sigsmall/PC 1990
- ACM/IEEE WAC 1989 1990 and session chair
- ACM/IEEE South Central Regional Conference and session chair
- Scott Foresman
- ACM Computing Reviews
- Addison Wesley
- Times Mirror Mosby
- Little Brown
- Prentice Hall

Appendix 10
Faculty Presentations

Maria Zamfir-Bleyberg

"AND/OR Algebraic Theories" presented at the 5th Workshop on the Mathematical Foundations of Programming Language Semantics, Tulane University, March 1989.

Myron Calhoun None

David Gustafson

None

William Hankley

None

Rod Howell

I gave a presentation, "System Simulation and the Sensitivity of Self-Stabilization," as a colloquium here, October 26, 1989, and as an invited talk at Iowa State University, November 9, 1989.

Austin Melton

Category Theory and Computer Science (Manchester, England, September).
University of Tulsa in February ("Software Measures")
University of Darmstadt in July ("Eine Kategorie von Galois- Verbindungen")
University of Aarhus, Denmark in November ("A New Connection").

Masaaki Mizuno

Department research seminar "Distributed mutual exclusion algorithms", 11/30/89

K. Ravindran

None

David Schmidt

Algebraic Methodology and Software Technology Conf., Iowa City, May
INRIA, Rocquencourt, June
Univ. of Rennes/IRISA, France, June
University of Copenhagen, June
Univ. of Glasgow, July
Univ. of Edinburgh, July
Colorado State Univ., Nov
Oregon Graduate Institute, Beaverton, OR, Nov
Tektronix Labs, Beaverton, OR, Nov

Elizabeth Unger

INTERFACE between Computing and Statistics given in Orlando Florida in April on the Information Disclosure Problem and its relationship to the Data Aggregation Problem.

Research Seminar given to the Department of Computer Science at University or Missouri at Kansas City on the Data Aggregation Problem.

Invited Address to INTERFACE Conference April 1989.

Maarten van Swaay

Ethical Computing, DECUS.

Virgil Wallentine

"Computing Research at KSU" at Silicon Prairie Assn, Kansas City, KS.
"Essential 8 Departments in Arts & Sciences", Arts & Sciences seminars.
"Computer Viruses", Scholarship Day.

Consultant: Louisiana Board of Regents on Computer Education in the entire school system in Louisiana

Maarten van Swaay

Applied Computing Workshop
DECUS Natl Symposium

Virgil Wallentine

Refereed for:
IEEE Software
ACM SIGSMALL/PC 1990
Scott Foresman
ACM/IEEE WAC 1990

KSU Dept. of Computing and Information Sciences Departmental Network