TECHNICAL ELECTIVES

The "technical" electives must be a coherent, related set of courses - they should "hang together" in some way. (However, they do NOT have to be technical in the sense of being hard or scientific or mathematic in nature!) They should be approved by your advisor, who will sign your curriculum guide form after you list the technical electives. They can be all elective computer science courses or they can include courses from related departments (most commonly business, engineering, math and statistics). Sample groups of "technical" elective courses are listed below. Remember, these are just suggestions. You can put together your own technical electives.

Some students plan a strong "minor" area or even a dual major with some other department. Career opportunities are generally favorable for an individual who is knowledgeable in some application field and who can deal with the use of computers in that field.

On the other hand, if you intend to work with computer systems as opposed to applications, you should take several of the core computer science electives. (These are also the core of our MS program.) A strong program of computer science electives will put you in excellent stead for either a career or advance graduate work.

An elementary probability/statistics course is not required, but it is highly recommended for almost any program.

If you intend to do graduate study in computer science, you should take CS 670, Discrete Structures. For study at the PhD level, many schools require a reading knowledge of at least one foreign language. However, K-State does not have this requirement.
AREAS OF TECHNICAL ELECTIVES: (EXAMPLES)

1. Business Electives
   286 306 Operating Systems Laboratory
   286 662 Business Data Processing (COBOL II)
   286 765 EDP Systems Analysis
   305 260 Fundamentals of Accounting
   305 270 Managerial Cost Controls
   (or any course required for a BS in Business)

2. Computer Software Electives (also the core of the MS program)
   286 740 Introduction to Software Engineering
   286 700 Translator Design I
   286 720 Operating Systems II
   286 760 Information Organization and Retrieval

3. Scientific Computing Electives
   245 222 Analytic Geometry and Calculus III
   245 240 Series and Differential Equations
   286 780 Numerical Solution of Ordinary Differential Equations
   286 785 Numerical Solution of Partial Differential Equations
   550 571 Introduction to Operations Research II
   286 710 Computer Simulation Experiments

4. Mini/Micro Computer Systems
   286 658 Microcomputer Programming and Applications
   286 750 Computer Architecture Experiments
   EE 641 Design of Digital Systems
   EE 643 Computer Logic Laboratory
5. Other Areas for Technical Elective Courses
   --- dual degree with Electrical Engineering
   --- dual degree with Business
   --- dual degree with Mathematics

6. Miscellaneous Computer Science Electives
   (These do not constitute a "coherent" set of technical electives, but they can be combined with electives from other areas.)
   286 670 Discrete Computational Structures (recommended for persons entering graduate studies in Computer Science)
   286 690 Implementation Projects (special projects by arrangement with some faculty member)
   286 710 Computer Simulation
   286 725 Computer Networks
   286 736 Computer Graphics
   286 735 Artificial Intelligence
PAUL S. FISHER

Professor
Department of Computer Science
Kansas State University
Manhattan, Kansas 66506
Office Tel. (913) 532-6350

Education:
1963 BA Mathematics University of Utah
1964 MA Mathematics University of Utah
1969 PhD Computer Science Arizona State University

Teaching and Interests:
Languages and Language Implementation
Data Base Management System
Computer Architecture
Distributed Processing
Networking
Distributed Data Base Management Systems
Special Purpose--Functional Architecture
Automatic Generation of Data Base Systems and Application Software

Grants:
1. NSF Regional Conference 1970
2. Applicability of the Extensible Programming System (EPS) to General Software Problems 1975
5. Reliable Software Workshop 1974-1975
7. Portability Issues for Mini-Computers using IDMS, A Data Base Management System 1975
8. Heterogeneous Mini-Computer Network with Distributed Data Base Resources 1976-1977
10. Investigation of Mini Networks 1978
11. Communication Techniques 1976
15. Automatic Generation of Data Base System 1980
16. Full Screen Editor: An Experiment in Machine Independent Software 1981

Publications (papers and reports):


Research Interests:
There are two problems in which I am presently interested. The problems deal with movement and utilization of information and the understanding of that information. In the first case, I am working with information in the distributed environments. The objective is to develop a procedure which permits the movement of systems in a family of possible environments. For example, a data base consists of data of three essential forms: modifiable, non-modifiable, and derivable. Clearly, every data base must contain all modifiable and non-modifiable data. However, the inclusion of derivable data is optional. This type of data then comprises a range or family of equivalent data bases, and I am developing a framework for moving the data base and the corresponding applications over this range in an automatic fashion.

The second problem is, as indicated, dealing with understanding information. For example, a typewriter which types from verbal input is a case in point. This area borders upon AI, mathematics and information processing. We are well along into this area using a mathematical framework for describing such problems. It is called a pre-algebra for finitely inductive sequences. This class of sequences can be used to describe all regular phenomena. The typewriter is such a phenomenon.

Both of these areas are couched in larger areas of interest, especially the data base problem. Hence, I am interested in problems in several distributed processing and data bases, especially those with irregular internal structures, such as text data bases, networks, communication and associated languages for such systems.
DR. WILLIAM J. HANKLEY
Professor
Department of Computer Science
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Education:
1962 BS Electrical Engineering Northwestern Univ.
1964 MS EE (Information Science) Northwestern Univ.
1967 PhD EE (Computer Science) Ohio State Univ.

Teaching and Interests:
Programming languages
Compiler design
Software engineering
Computer graphics
Operating systems
Semantics of languages
Real-time software

Publications (papers and reports):

("*" denotes document report for funded project)


All available from Computer Science Department, Kansas State University, Manhattan, KS 66506, except as noted.


Current Research Interests:

Work on interactive systems for personal computers, including:
- development of a personal computing system for Chinese children using phonetic characters as the keying system.
- design of a portable "graphics-structured-Basic-like" language for personal computer with character graphics, pixel graphics, and moving object graphics (like sprites or player/missiles).
- development of instructional games for programming concepts compatible with PASCAL (somewhat like Karel the robot, but less robot and more gamelike).
- study of future architectures for personal computers, particularly the use of multiple processor for control of concurrent interactive activities.

Future Research Interests (joint with D. Gustafson):

We are studying possible future generations of software development systems. Such systems would be in the form of interactive user-friendly tools which provide aid for creation of programs. Potential keys for creation of programs include reuse of existing modules, specifications using assertions which are more descriptive than the current type information, using patterns from previous
programs, and at least partial creation of programs from specifications of input and output data structures. Initially, we are viewing such operations in the context of "smart" editing environment.
DR. ELIZABETH A. UNGER
Professor
Department of Computer Science
Kansas State University
Manhattan, Kansas 66506
Office Tel. (913) 532-6350

Education:
1963 M.S. Mathematics Michigan State Univ.
1978 Ph.D. Computer Science University of Kansas

Teaching and Interests:
1. Research Interests
   a) Programming Languages
   b) Information Retrieval Systems of Behavioral Science
   c) Computer Libraries
2. Courses Taught
   a) Data Base Management at B.S., M.S. and Ph.D. levels
   b) Programming Languages at B.S. and Ph.D. levels
   c) Computational Structures at Ph.D. level
   d) Data Structures at B.S. level
   e) Introductory Computer Science and Computer Literacy
   f) Distributed Systems at M.S. and Ph.D. levels
   g) Computing Service Center Management at M.S. level
   h) Numerical Analysis at B.S. level

Publications (papers and reports):


Engler, Verlyn, E. A. Unger, and Bryan Schurle, "The Potential for Microcomputer Use in Agriculture," Kansas Agricultural Experiment Station, Contribution number 81-412-A (also presented to the Agricultural Economics Annual Meeting, August 1981).


**Research Interests:**

The focus of all my research is distributed systems and the potential of operations that can be expressed within those systems. Currently, there are three active areas of research which are all interconnected.

1. The development of a model for the description of information within a computer environment. This model is called an object. The study of the properties of the data and the development of a calculus to manipulate and build new objects is the objective of this effort.

2. The use of the object in a language to allow the expression of concurrency without explicit action by the programmer. The language model exists and it is used to express office procedures in a current research project.

3. The use of the concept of an object (simplified) from the focus number one above, to implement a dynamic active data dictionary is the third area. An active dynamic dictionary has the advantage of making the physical structure and data completely invisible to user application programs. Currently, we can do this statically, but often programs must be recompiled for even minor changes in data storage or data constraints. Theoretically, this would allow two things: a) complete freedom of the DBA to change the data base and DBMS, and b) the integration of heterogeneous data base systems within a distributed environment.
DR. VIRGIL E. WALLENTINE
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Computer Science Department
Kansas State University
Manhattan, Kansas 66506
Office Tel. (913) 532-6350

Education:
1965  BS  Mathematics  Iowa State University
1970  MS  Computer Science  Iowa State University
1972  PhD  Computer Science  Iowa State University

Teaching and Interests:
Operating Systems
Programming Languages
Computer Networks
Software Engineering
High-Level Language Architecture
Office Automation

Grants (Funded):
1976 -


1977  V. E. Wallentine and W. J. Hankley, Principal Investigators. Simulation of Network Performance for Distributed Data Base Configurations ($8,196). NCR Corporation

1978  V. E. Wallentine, Principal Investigator. A Network Based Operating System ($38,000). Grantor: Advanced Development Division Perkin-Elmer Data Systems

1978 -

1979  V. E. Wallentine, Principal Investigator. NSF Travel Grant ($3,600)

1980 -  

1983 V. E. Wallentine, Principal Investigator. Western Electric Graduate Program ($166,000).

Equipment Grants:
1976 ($190,000) with Paul S. Fisher and Fred J. Maryanski. Minicomputer equipment from Interdata
1977 ($35,000) minicomputers, terminals, and communications interfaces from Perkin-Elmer Data Systems
1979 ($50,000) minicomputer from NCR Corp. Wichita, Kansas
1980 ($26,000) minicomputer memory from Perkin-Elmer Data Systems

Publications (papers and reports):


