A

RESEARCH and EDUCATION

RESUME

March 1983

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EDUCATION AND RESEARCH
IN
COMPUTER SCIENCE

A
Resume

KANSAS STATE UNIVERSITY

Kansas State University, Manhattan, Kansas, is the oldest land-grant college in the United States. It has grown from 52 students enrolled on September 2, 1863 to more than 19,000 full-time students in 1983 to become one of the major educational institutions in America. K-State is fully accredited by the North Central Association of Colleges.

Launched primarily as an agricultural school, K-State has evolved into an important scientific and cultural University. Its primary thrust is still in the field of Agricultural Education and Research and KSU is known internationally for its contributions to crop and animal science and to agricultural economics and engineering. The University is also renowned for its contributions to the applied sciences and the majority of KSU students seek degrees in the disciplines of the applied sciences.

The University awards degrees of Bachelor of Arts, Science, Architecture and Music; Master of Arts, Science, Business Administration, Landscape Architecture, Music and Regional/Community Planning; and Doctor of Philosophy in 33 fields of study including Doctor of Veterinary Medicine. There are 61 academic departments on the campus and a Division of Continuing Education extends the University's educational services to more than 10,000 off-campus students. The KSU Agricultural Experiment Station conducts research on more than 7,000 acres of crop and grass lands in support of the University's training and research programs. In cooperation with the Atomic Energy Commission, the University operates one of the major facilities for accelerating atomic particles. The Nuclear Engineering Department operates a TRIGA MKII nuclear reactor.

The 153-acre campus is located at Manhattan, Kansas, a city of 30,000 people. The city is located 120 miles west of Kansas City, Missouri, on the Kansas River, and 14 miles from the historic military reservation of Fort Riley. Access to Manhattan may be by Air Midwest and Capitol Air Lines out of Kansas City International Airport or by car, Interstate Highway 70, 8 miles south of the city. Popular motels are located in the city and provide national standard and deluxe accommodations for visitors.

DEPARTMENT OF COMPUTER SCIENCE

The Computer Science Department, College of Arts and Sciences is in its second decade of service to the University. Since 1972, the department has offered a degree of Doctor of Philosophy. In support of that offering, the department has become increasingly active in Computer Science research and has built a dynamic research facility of hardware and people. Teaching, however, remains the department's primary objective and a full undergraduate computer science curriculum is offered to the University students. In addition, the department provides a number of off-campus courses to both undergraduate and graduate students at a number of locations. Off-campus teaching includes Old Trooper University at Ft. Riley, Kansas, and Command and General Staff College at Ft. Leavenworth, Kansas. A summer Computer Science graduate program brings 70 Western Electric professionals to campus each summer.

The department has 13 full-time faculty (12 with Ph.D.), and 3 part-time faculty joint with the University Computing Center, and 45 graduate assistants. In addition, 15 faculty at the University of Kansas are adjunct in the Ph.D. program. Currently, there are 600+ undergraduate majors, 150 Master's Degree students and 10 Ph.D. students enrolled on campus. At Ft. Leavenworth, there are some 10 additional Master of Science students enrolled in the joint KSU-CGSC program.

The Ph.D. program in Computer Science is offered jointly by KSU and the University of Kansas at Lawrence, Kansas. Although each University awards the Ph.D. degree to its respective students, the joint arrangement makes the facilities, hardware, and personnel of both institutions available to students. In line with the founding philosophy of land-grant colleges, the thrust of effort at K-State is toward applied computer sciences. The thrust at the University of Kansas is toward formal theory of computer science. Accordingly, the research at KSU has been oriented towards practical and applied computing systems.

RESEARCH
COMPUTER SCIENCE DEPARTMENT, KSU

DR. VIRGIL WALLENTINE, PROFESSOR AND HEAD

Overview

The department supports faculty research and development activities as central to a strong graduate program. Faculty specialties include language and compiler design, operating systems techniques, computer architecture, software engineering, artificial intelligence, data management systems, computer graphics, expert systems, and computer systems simulation and evaluation. The department offers a strong graduate emphasis in the area of software engineering which includes the design, management and documentation of large software projects. Recent emphasis has centered on computer networks, network interfaces, network operating systems, and distributed computing software. This emphasis is in reaction to the expanding use of minicomputers and microcomputers in information processing systems and the proliferation of software problems attendant thereto.

Research is conducted primarily by faculty members assisted by graduate students. Significant research is done by Ph.D. candidates under supervision of the faculty. Facilities available in support of research include the University Computing Center, the Department Computer Laboratory, the University of Kansas Computing Facility and the University library.

The department's capabilities to support research are growing each year. The scope of capabilities is best illustrated by this partial list of graduate courses currently offered:

Artificial Intelligence
Computer Graphics and Image Processing
Computer Networks
Computer Systems Simulation
Data Base Management Systems
Expert Systems
Microcomputer Programming and Applications
Minicomputer Systems
Office Automation
Operating Systems
Software Engineering
Theory of Parsing
Translator Design

Extramural Funding

The Department of Computer Science has an established program of support from private industry and the Federal Government dating back to 1974. Since 1977, the extramural support for research in the Department totals more than one million dollars. Projects for the Federal

Government include portable operating systems for small systems, quality control in software engineering, computer network software, and data base management systems. Projects from private industry include network operating systems, compiler construction, high-level language computer architecture, data base management machine architecture, computer network performance evaluation, and distributed processing.

Current Research Directions

Research in the Department of Computer Science is aimed at providing computer systems and applications which are state-of-the-art in support of human problem solving and in utilization of high technology hardware. These areas include distributed systems architecture, office automation, fifth-generation systems, computer programming languages, and computer education for rural America. Some of the projects currently underway are listed below.

Work in the area of distributed processing systems includes a network operating system and its distributed programming environment under the direction of Dr. Wallentine. Dr. Paul Fisher is directing research into parallel processing of conventional programming languages on concurrent architectures. Dr. Fisher is also working in the areas of structuring and moving data bases and understanding information systems. Dr. Beth Unger is directing research into an integrated data-object approach to distributed data management systems. Dr. Richard McBride is conducting research into formal models of computer network protocols and distributed processing algorithms.

Work in office automation includes the research of Dr. Richard McBride who is working on "forms" as the basic entity that is represented in the computer and on the screen for work in the office of the future. Office automation research at KSU also encapsulates use of the CODASYL Common Operating System Command Lanugage as an intermediate level implementation tool in the office of the future. This work is being jointly carried out by Drs. Wallentine and McBride.

Work on fifth-generation computing systems includes the development of an expert planning system capable of general application. The first application of this system will be in a student advising and laboratory instructional environment. This work and other artificial intelligence research, under the direction of Dr. Hartley and Clifford Stark, includes topics such as theorem proving, knowledge representation, and natural language. A second thrust in fifth-generation systems is being directed by Dr. William Hankley and Dr. David Gustafson. This work is concerned with programming language oriented editors which are applied to very sophisticated program development systems. Components of this system include user-oriented tools, program generators, assertion-checkers, and style-checkers which give immediate feedback to the user. Research into user-oriented graphics, software metrics and software testing for fifth-generation software is also being conducted by Drs. Hankley and Gustafson.

Work in programming languages is a central element of any computer science department and all faculty participate in this area. Several specific projects that are currently underway include naturally concurrent languages under Dr. Unger, portability of systems languages (and thus the systems implemented in them) such as Pascal, Simula, and Euclid under the direction of Dr. Wallentine and Dr. Bates, design of concurrent programming languages conducted by Dr. Bates, languages for expert systems under Dr. Hartley and Cliff Stark, user-oriented terminal languages under Dr. Hankley and Dr. Gustafson, and forms editing languages under Dr. McBride.

Computer education for rural America is as important in Kansas as it is across the country. Dr. Roger Terry is an investigator on a grant through the Kellogg Foundation which is attempting to provide the agricultural industry of Kansas with computer education and state-of-the-art business software.

COMPUTING RESOURCES AT KANSAS STATE UNIVERSITY

Computing resources at K-State include the University Computing Center, the Computer Science Department's Computing Laboratory, the University Data Processing Center, remote terminal processing to the facilities of the University of Kansas, and minicomputers located within the Departments of Electrical Engineering, Physics, and Chemistry. Almost from their date of conception, computers have been integral to the applied sciences teaching and research at K-State. Digital computer capabilities have been available at the University since March 1956. The University Computing Center was established in 1957 with an IBM 650 computer. The University's computing facilities have kept pace with the dynamic capabilities of the computing industry.

The Computing Laboratory in the Department of Computer Science

The Computing Laboratory is a facility of the Department of Computer Science and supports research and graduate instructional requirements. The principal facilities of the Lab are minicomputers. The computers can operate individually, in a network and in a link to the NATIONAL 6130 in the Computing Center. The facility permits the investigation and teaching of computer network techniques and the teaching and investigation of computer software in a relatively inexpensive but highly capable hardware environment. The hardware includes:

2 Motorola 68000 systems running UNIX	2 Meg bytes
3 Perkin-Elmer 32 bit systems running UNIX	2.5 Meg bytes
1 PDP 11/34 running UNIX	256K bytes
3 IBM PCs running VISION operating system	1 Meg bytes
1 APPLE II	64K bytes
1 ATARI 800	64K bytes
1 Chromatics	64K bytes
2 Western Digital Pascal Microengines	256K bytes
1 Tandem Non-stop II (4 MBytes dual processor)	

The peripheral equipment includes:

50 CRT terminals
1 Stand alone graphics computer
1 Portable printing terminal, T1700
4 Magnetic tape units
1 Color graphics printer
3 Line printers
3 Letter quality printers
5 Graphics printers
Disk subsystems totaling 700 megabytes

The software systems available in the Computer Science Computing Laboratory include:

Pascal
Concurrent Pascal and a concurrent symbolic debugger

UCSD Pascal
Euclid
Concurrent Euclid
FORTRAN
UNIX System V
Berkley UNIX
Simula
BASIC
GKS color graphics
LISP
LOGO
Network software
CSNET
Office automation software
CPM/86
INGRESS data base management
Various micro-processor operating systems
Numerous micro- and minicomputer application programs

The Computing Center

The Computing Center is a service department of the University for the support of the research and instructional needs of the faculty, staff, and students. The principal facility is a NATIONAL 6130 with 8 megabytes of main core and 1,500 megabytes of associated direct access storage. Users can access the computer through a combination of batch service, local terminals and several remote typewriter and card reading terminals.

Operating systems include:

OS/MFT	VM/370

Interactive systems

APL	CMS

Languages

ALGOL-60	LISP 1.5	SPITBOL	RPG II
BAL	PL/1	WATBOL	WPASCAL
COBOL	PL/C	WATFIV	WBASIC
FORTRAN	SNOBOL4	PASCAL	

Applications

BMD	GPSS	SPSS
CSMP	MPS/360	SAS
FORMAC	NEATER2	SURFACE2

DBMS

Total
IDMS
S2000

Other University Facilities

The other facilities at K-State include several NOVA computers and a VAX in the Department of Electrical Engineering, and several PDP minicomputers in the Departments of Physics, Chemistry, Psychology, Biochemistry, Ag Engineering and Chemical Engineering. The computers support computing requirements of these departments and can support computer science needs on an infrequent basis. The University Data Processing Center operates an IBM 4341 to support the University administrative data requirements. This facility is available to support computer science needs on an infrequent basis.

Remote Facilities

Through dial-up telephone service, the University of Kansas main computer is available. The main computer is a Honeywell DPS 3/E with 768K (words) of memory. The full set of the common high-level languages is available to KSU users as are numerous application program packages.

Revised 4/83

KANSAS STATE UNIVERSITY

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 Computer Science (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 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 - Fairchild 121 after you have been advised!

Figure 1.

CS MAJOR REQUIREMENTS

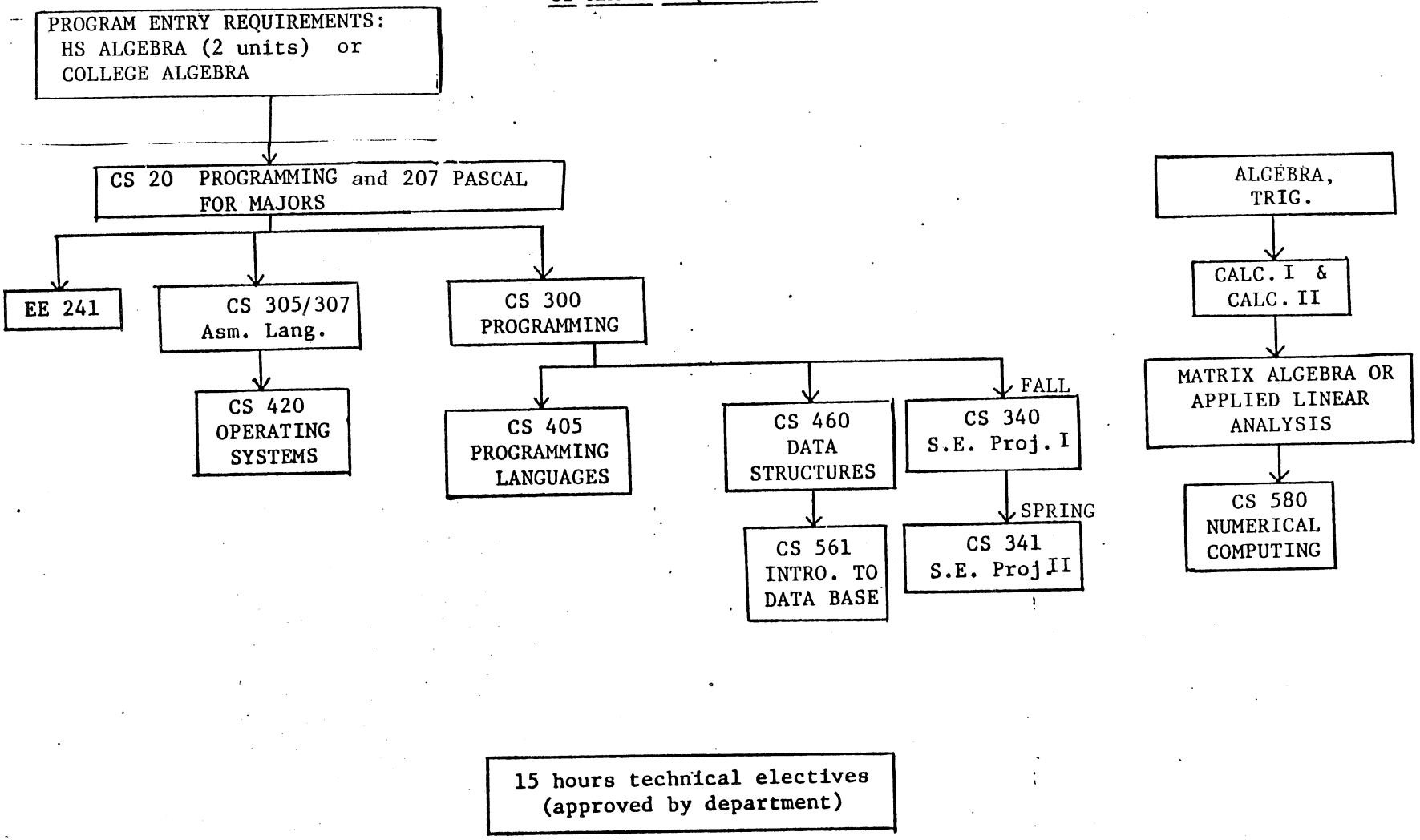
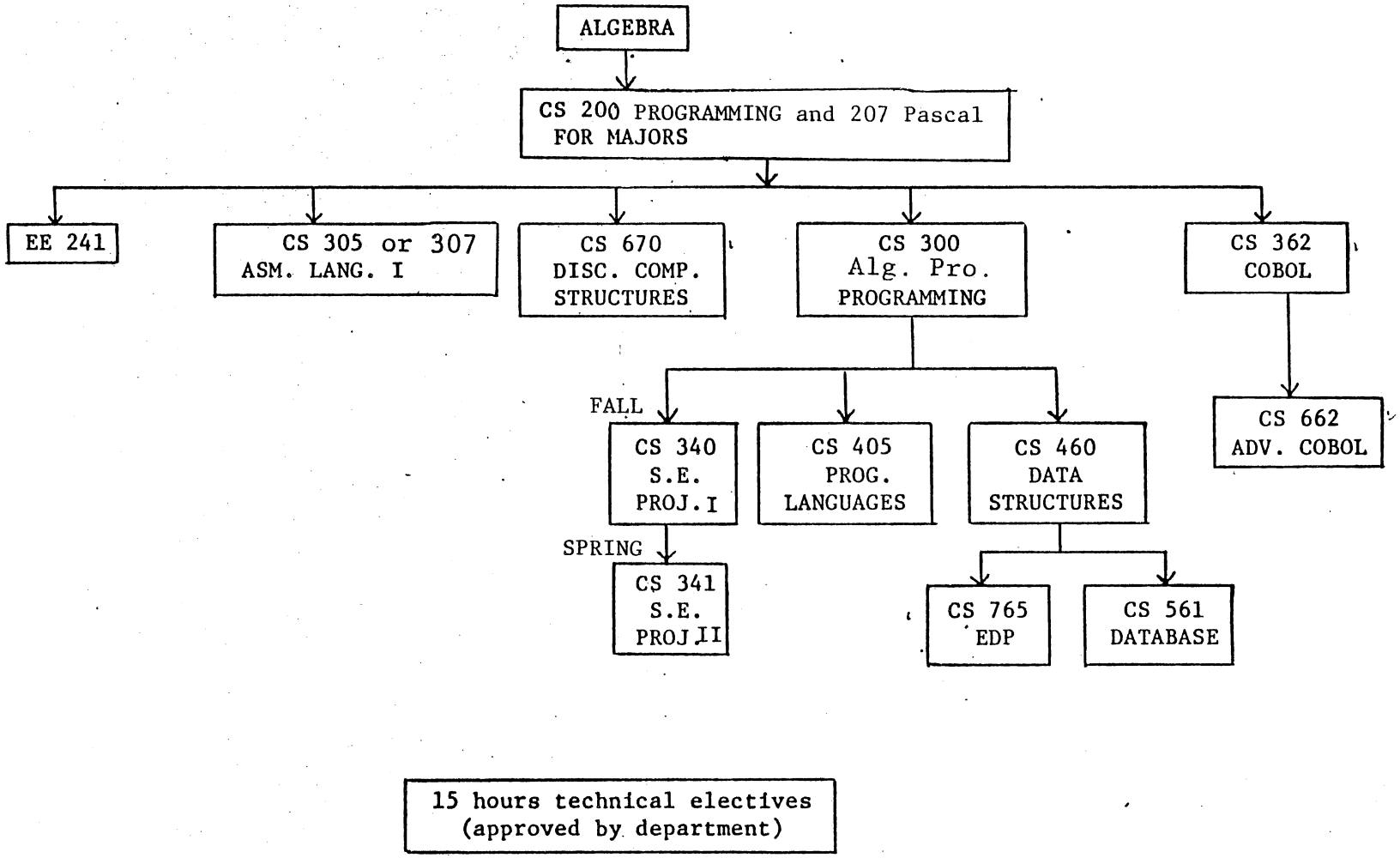


Figure 2.
INFORMATION SYSTEMS REQUIREMENTS



Name _____

Address _____

Entrance date _____ S.S. # _____

KANSAS STATE UNIVERSITY

COLLEGE OF ARTS AND SCIENCES

CURRICULUM AND GRADUATION REQUIREMENT GUIDE

BACHELOR OF SCIENCE DEGREE

Effective Date: August 1981

Curriculum _____

TRANSFER CREDITS PRESENTED

College or University	Sem. Hrs.

Credit which has been transferred to KSU but not definitely assigned at this time:

Only ½ of the hours required for a KSU degree can be applied from a two-year college.

GRADUATION REQUIREMENTS	
TOTAL hours required	120
KSU graded hours attempted _____	
Overall KSU G.P.A. _____	
KSU hours of F _____	
KSU graded hrs. applied	
KSU non-graded hrs. applied	
Transfer credit hrs. applied	
REMAINING HOURS	

ELECTIVES

REMEMBER--You must file an Application for Graduation Clearance with your Dean's Office during the first 4 weeks of the semester in which you expect to graduate.

If you do not graduate as scheduled you must submit a new Application for Graduation Clearance for a subsequent semester.

You must earn a grade point average of at least 2.0 on all KSU resident graded hours applied toward your degree.

If you have any questions concerning any of the requirements, see your advisor or Dean.

DATE _____

MAJOR

COMPUTER SCIENCE (CS)
INFORMATION SYSTEMS (IS)

Courses for CS degree:		
(CS) Anal.Geom.& Calc.I	M220	4
(CS) Anal.Geom.& Calc.II	M221	4
(CS) App. Matrix Theory	M551	3
or		
(CS) Elem.of Appl.Lin.Anal.	M224	3
(CS) Numerical Comp.	580	3

Courses for BOTH majors:		
Fund. of Comp. Prog.	200	2
PASCAL	207	2
Intro. to Comp. Eng.	241	3
Algorithmic Proc.	300	3
Comp. Org. & Prog. I	305/307	3
Software Eng. Proj. I	340	2
Software Eng. Proj. II	341	2
Intro. to Prog. Lang.	405	3
Oper. Systems I	420	3
Data Structures	460	3
Intro. Data Mgmt. Sys.	561	3

Courses for IS degree:		
(IS) Int. Bus. Prog.	362	3
(IS) Bus. Data Pro.	662	3
(IS) Dis. Structures	670	3
(IS) Sys. Analysis	765	3

Plus 15 hours technical electives approved by advisor.

BASIC REQUIREMENTS

SEE CURRENT LISTING FOR COURSES THAT FULFILL REQUIREMENTS.

	Sem. Hrs.
English Comp I	(3)
English Comp II	(3)
Oral Communications	(2-3)
Concepts PE	(1)
Humanities: 4 courses	(11)
1. Fine Arts	
2. Philosophy	
3. Western Heritage	
4. Literary or Rhetorical Arts	
Social Sciences: 4 courses	(12)
1.	
2.	
3.	
4.	
Natural Sciences: 4 courses	(14)
1. Life Science with Lab	
2. Physical Science with Lab	
3. Life or Physical Science	
4. Course with prerequisite in same department.	
Quantitative: Select 1, 2 or 3	
1. Three courses (9) from mathematics, statistics, computer science, philosophy:	
2. One of the following courses: Gen. Physics I, Quantitative Anal. in Geog., Methods of Social Research, Intermediate Quant. Meth. (Soc)	
And its Level II prerequisite:	
3. One Level III course, or two Level II courses.	
International Overlay: 1 course	

Name _____

Address _____

Entrance date _____ S.S. # _____

KANSAS STATE UNIVERSITY

College of Arts and Sciences

CURRICULUM AND GRADUATION REQUIREMENT GUIDE

BACHELOR OF ARTS DEGREE

Effective Date: August 1981

Curriculum _____

TRANSFER CREDITS PRESENTED

College or University	Sem. Hrs.	Credit which has been transferred to KSU but not definitely assigned at this time:

Only ½ of the hours required for a KSU degree can be applied from a two-year college.

GRADUATION REQUIREMENTS		ELECTIVES
TOTAL hours required	120	
KSU graded hours attempted _____		
Overall KSU G.P.A. _____		
KSU hours of F _____		
KSU graded hrs. applied		
KSU non-graded hrs. applied		
Transfer credit hrs. applied		
REMAINING HOURS		

REMEMBER—You must file an Application for Graduation Clearance with your Dean's Office during the first 4 weeks of the semester in which you expect to graduate.

If you do not graduate as scheduled you must submit a new Application for Graduation Clearance for a subsequent semester.

You must earn a grade point average of at least 2.0 on all KSU resident graded hours applied toward your degree.

If you have any questions concerning any of the requirements, see your advisor or Dean.

DATE _____

COMPUTER SCIENCE (CS) INFORMATION SYSTEMS (IS)

Courses for CS degree:		
(CS) Anal.Geom.& Calc.I	M220	4
(CS) Anal.Geom.& Calc.II	M221	4
(CS) App. Matrix Theory	M551	3
or		
(CS) Elem.of Appl.Lin.Anal.	M224	3
(CS) Numerical Comp.	580	3
Courses for BOTH majors:		
Fund. of Comp. Prog.	200	2
PASCAL	207	2
Intro. to Comp. Eng.	241	3
Algorithmic Proc.	300	3
Comp. Org. & Prog. I	305/307	3
Software Eng. Proj. I	340	2
Software Eng. Proj. II	341	2
Intro. to Prog. Lang.	405	3
Oper. Systems I	420	3
Data Structures	460	3
Intro. Data Mgmt. Sys.	561	3
Courses for IS degree:		
(IS) Int. Bus. Prog.	362	3
(IS) Bus. Data Pro.	662	3
(IS) Dis. Structures	670	3
(IS) Sys. Analysis	765	3
Plus 15 hours technical electives approved by advisor.		

BASIC REQUIREMENTS

SEE CURRENT LISTING FOR COURSES THAT FULFIL REQUIREMENTS.

		Sem. Hrs.
English Comp I	(3)	
English Comp II	(3)	
Oral Communications	(2-3)	
Concepts PE	(1)	
Foreign Language: 4 courses	(15)	
1. _____		
2. _____		
3. _____		
4. _____		
Math: 1 course	(3)	
_____		
Humanities: 4 courses	(12)	
1. Fine Arts		
2. Philosophy		
3. Western Heritage		
4. Literary or Rhetorical Arts		
Social Sciences: 4 courses	(12)	
1. _____		
2. _____		
3. _____		
4. _____		
Natural Sciences: 3 courses	(11)	
1. Life Science with Lab		
2. Physical Science with Lab		
3. Life or Physical Science		
International Overlay: 1 course		
_____		

LIST OF COURSES THAT FULFILL DEGREE REQUIREMENTS

AS OF JANUARY 1983

English Composition I and II
Oral Communications I (or Argumentation and Debate, or Public Speaking as recommended by Department of Speech)
Concepts of Physical Education

Humanities: 4 courses 11 hours minimum

Up to 2 courses from a single department 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. No course may be used to satisfy more than one specific requirement in this section. Only courses taken for 2 or more credit hours satisfy these requirements, and courses in excess of 5 credit hours count as 2 courses.

1. Fine Arts:
   - Art technique courses 200-799 or art history courses
   - Dance technique courses 323, 324, 325, 326
   - History of Dance 459
   - Music Styles I 175, and II 176
   - Music history and literature 200-799
   - Applied music 252-799
   - Theater 260-799
   - Dance as an Art Form 205

2. Philosophy — any course except:
   Intro. Formal Logic 110, Symbolic Logic I 220, Comparative Religion 310, Symbolic Logic II 510

3. Western Heritage
   - History courses in Greco-Roman, Western European or North American fields (refer to 5-81memo)
   - Women's Studies, Intro. 105 & Sr. Seminar 405
   - Humanities (English)
     Classical Cultures 230, Medieval & Renaissance 231, Baroque & Enlightenment 233, Modern 234
   - Modern Languages
     French Civilization 514, German Civilization 530, Spanish Civilization 565, Hispanic-American Civilization 566
   - Constitutional Law (Political Science)
     Defendant's Rights 713, Constitutional Law I 714, Constitutional Law II 715, Discrimination & the Law 716, Pro-Seminar in Political Science 799
   - Political Thought
     Intro. 301, Classical to 16th Century 761, Since 16th Century 763, American 767, Modern 771, Religion 775, Development of Social Thought (Sociology) 709

4. Literary or Rhetorical Arts
   - Literature or Creative Writing courses offered by English Department except Fiction into Film 220 and Literature & Film 520 (refer to 5-81 memo)
   - Modern Languages — literature courses including literature in translation offered by the Department (refer to 5-81 memo)
   - Speech
     Intro. to Oral Rhetorical Study 330, Seminar in General Semantics 720, History of American Public Address 725, Rhetorical Theory and Criticism 730, Medieval & Renaissance Rhetoric 731, Modern Rhetoric 732
   - Theater
     Playwriting 562, Early American 764, Greek 770, Roman, Medieval & Baroque 771, Romantic 772, Modern European 773, Avant-Garde 774, Slavic 776,

BS Degree only: Two courses in one foreign language will satisfy the requirements of 3 and 4.

Social Sciences: 4 courses from 3 disciplines
12 hours minimum

Up to 2 courses from a single department 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 the following:
Psychology, Sociology, Cultural Anthropology (including Archaeology), Economics, Political Science, History, Geography (except Environmental I 220 and II 221)

The 4th course must be from 1 of the above or from the following:
- Women's Studies, Intro. 105 and Senior Sem. 405
- Physical Education
  Soc. Dimensions 340 or Motor Dev. & Learning 320
- Linguistics (Speech) except:
  Manual Communications 400,
  General Phonetics 681
- Speech
  Analysis of Experimental Research Literature in Speech 320, Nonverbal Communication 622, Communication Research Methods 721, Sem. in Persuasion 726
- Journalism & Mass Communications
  Survey of Mass Media 235, Black Press in America 645, History of Journalism 660, Law of Mass Communications 665, The Mass Communicator: Ethics & Issues 685
- Radio & Television
  History of Broadcasting 660 or Radio-Television Criticism 675

Natural Sciences: BS Degree = 4 courses 14 hrs. minimum
BA Degree = 3 courses 11 hrs. minimum

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

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

   Life Sciences: Biology, Biochemistry, Paleobiology I (Geology) 580, Paleobiology II (Geology) 581, Paleoecology 704, Intro. Physical Anthropology 280, 281, Fossil Man and Human Evolution 688, Primatology 691, Osteology 694, Osteology Lab 695

   Physical Sciences: Physics, Chemistry, Environmental Geography I 220 and II 221 only, Geology except for Paleobiology I 580 and II 581, Paleoecology 704

4. BS Degree only: One course (3 credit hour minimum) with a prerequisite in the same department chosen from the following: Life or Physical Sciences listed in #3, Biochemistry courses with a chemistry prerequisite, Physical Education — Kinesiology 330, Physiology of Exercise 335, Psychology — Fundamentals of Perception & Sensation 480, Comparative Psychology 616.

List of courses continued on other side.

Quantitative and Abstract Formal Reasoning: BS 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:
   Mathematics, Statistics, Computer Science 200-799, Philosophy -- Intro. Formal Logic 110, Symbolic Logic I 220, Symbolic Logic II 510 only

   It is not necessary to take all 3 courses from a single department.

2. One of the following pairs:
   General Physics I 113 and Trigonometry 150
   Quantitative Analysis in Geography 700 and Stat. I level course
   Methods in Social Research 520 and Stat. I level course
   Intermediate Quantitative Methods 725 and Stat. I level course
   Measurement and Evaluation in PE 710 and Stat. I level course

3. Level II: 2 courses
   Mathematics -- Elementary Cryptanalysis 120, College Algebra & Trig. 125, Plane Trig. 150, Precalculus Mathematics 170, General Calculus & Linear Algebra 205
   Statistics -- Elements of Stat. 320, Elementary Statistics for the Social Sciences 330, Biometrics I 340, Business & Econ. Stat. I 350, Statistical Methods for Social Sciences 702, Statistical Methods for Natural Sciences 703
   Philosophy -- Symbolic Logic II 510
   Computer Science -- Fundamentals of Computer Programming 200 and one of the following: Fortran 201, PL/1 202, APL 203, Basic 206, Pascal 207, Fortran/Engg. 211

   -- OR --

   Level III: 1 course
   Mathematics -- Technical Calculus I 210, Analytic Geometry & Calculus I 220, Analytic Geometry & Calculus I-S 225
   Statistics -- Biometrics II 341, Business & Econ. Stat. II 351, Analysis of Variance & Covariance 704, Regression & Correlation Analyses 705
   Philosophy -- Topics in Metalogic 701
   Computer Science -- Algorithmic Processes 300, Computer Organization & Programming I 305

Foreign Language: 4 courses 15 hours BA Degree only
One of the foreign language sequences offered by the Department of Modern Languages or equivalent competency.

Mathematics: 1 course 3 hours BA Degree only
100-799 level course offered by the Department 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. Cultural Honors 201, Civilizations of South Asia I 505, Civilizations of South Asia II 506, Folk Cultures 507, Male & Female 508, Cultural Ecology & Economy 511, Political Organization in Folk & Nonliterate Cultures 512, Black Cultures of the Americas 536, Cultures of India & Pakistan 545, Culture and Personality 604, Religon in Culture 618, Indians of North America 630, Indian Cultures of South America 634, Precolumbian Civilizations of Mexico & Guatemala 673

Economics
Civilizations of South Asia I 505, Civilizations of South Asia II 506, Capitalism & Socialism 636, International Trade 681, Underdeveloped Countries 682

Geography
World Regional 100, Latin America 620, Europe 640, Soviet Union 650, Australia & New Zealand 670, Hunger 710, World Population Patterns 715

History
Russian Culture & Civilization 250, American Ethnic Roots 321, Gandhi & Indian Revolution 350, History of Hinduism 504, Civilizations of South Asia I 505, Civilizations of South Asia II 506, South Asian History I 507, South Asian History II 508, World War II 514, U.S. & World Affairs 1776--Present 543, U.S. & Soviet Relations since 1917 544, War in 20th Century 545, Colonial Hispanic America 561, Modern Mexico 562, European Diplomatic History to Napoleon 576, European Diplomatic History since Napoleon 577, Russia to 1801 591, Topics Russian History 593, Topics in Non-Western History 598, Russian Revolutions & Soviet System 564

Journalism & Mass Communications
International Communications 670

Management
International Business (Bus. Adm.) 690

Marketing
International Marketing (Bus. Adm.) 644

Modern Languages
Russian Culture & Civ. 250, Russian Lit. in Translation: 19th Century 504, Russian Lit. Translation: Soviet Period 508, Religious Lit. of South Asia 509, Survey Russian Lit. 552

Philosophy
Comparative Religion 310

Political Science
World Politics 333, Civilizations of South Asia I 505, Civilizations of South Asia II 506, Contemporary Chinese Politics 511, Interdependence in International Politics 542, Politics of Developing Nations 545, Latin American Politics 722, South Asian Political Systems 723, Mid. East Political Systems 724, Southeast Asian Political Systems 725, African Political Systems 726, Soviet Political Systems 727, Comparative Security Establishments 728, Admin. in Developing Nations 729, International Relations 741, International Conflict 742, American Foreign Policy 743, International Politics Europe 745, International Law 747, International Defense Strategies 749, International Organization 751, International Politics South Asia 752, International Politics Mid. East 753

Sociology
Civilizations of South Asia I 505, Civilizations of South Asia II 506, Society & Change South Asia 742