COMPUTING CURRICULA GUIDELINES
FOR
ASSOCIATE-DEGREE PROGRAMS

IN

# COMPUTING FOR OTHER DISCIPLINES


TWO-YEAR COLLEGE
COMPUTING CURRICULA TASK FORCE

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THE ASSOCIATION FOR COMPUTING MACHINERY

*Computing for Other Disciplines*

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GUIDELINES FOR
COMPUTING FOR OTHER DISCIPLINES

**TABLE OF CONTENTS**

PART I
A STRUCTURE FOR COURSES

PART II
COURSE KNOWLEDGE UNIT DETAILS



PART III
SAMPLE COURSE IMPLEMENTATIONS



PART IV
SUPPORTIVE INFORMATION

## LIST OF FIGURES



## LIST OF TABLES

# PART I

# A STRUCTURE FOR COURSES

## 1.0 INTRODUCTION AND CHARTER

In 1990, the Association for Computing Machinery (ACM) awarded the ACM Two-Year College Computing Curricula Task Force preliminary funding to develop curricular guidelines for two-year programs. The Task Force identified four broad but distinct curricular areas and the area of computing for other disciplines. Five separate committees were formed to investigate the following areas:

Computer Support Services (CSS)
Computing and Engineering Technology (CET)
Computing for Information Processing (CIP)
Computing Sciences (CS)
Computing for Other Disciplines (COD)

Each group solicited participation by a large number of individuals and produced a separate report. The Executive Report of the Task Force acknowledges the contributions of all those who contributed to the work of the Task Force, participated in working sessions, or provided critical reviews.

This report addresses computing for other disciplines. The role of computing in disciplines other than those primarily emphasizing computing itself is growing rapidly. Computing technology is becoming an integral part of every field of study and every profession. Therefore, it is imperative that any computing curriculum study address the issue of computing for other disciplines.

Throughout the history of computing, there has always been a need to train and educate people about computing. In the 1940's and early 1950's, these people were from highly specialized disciplines in which solutions were needed for problems either too large or too time consuming for humans. These specialists had to learn machine or assembly language to communicate the problem solution directly to the computer. Limited hardware and its complexities resulted in computers being used by limited numbers of individuals who needed the power of the computer.

In the late 1950's and in the 1960's, courses and programs in computer science appeared. More people needed computers, but the number was still relatively small. Courses were developed to assist people to learn how to use the computer. The courses were usually programming courses in FORTRAN and COBOL. As time-sharing computers evolved, courses in BASIC were offered. As access to computers increased, the number of people wanting to know about them increased.

With the advent of microcomputers, demand for computer knowledge mushroomed. Needs changed because individuals began to use computers for personal reasons. Courses in BASIC became even more popular because of its suitability to microcomputers. Soon, courses commonly referred to as *computer literacy* became popular for people in non-computing disciplines. These courses generally included descriptions of computer components, introduction to programming, survey of computer applications, and discussion of societal issues.

With increased access to computers, new uses for computers evolved. Applications software burgeoned, and software quality improved dramatically. Applications software led computing into other disciplines.

In the 1980's, introductory courses for students in other disciplines gave way to courses featuring word processing, spreadsheets, and databases with a corresponding decrease in emphasis on programming. These courses were taken by an increasingly large number of students, and usually involved some laboratory experience. Primary emphasis was on developing skill and facility with the computer applications software.

Throughout the evolution of computer education, no organization supported a report with recommendations specifically addressing courses for other disciplines. The present report is the first to make such recommendations.

## 2.0 GOALS AND OVERVIEW OF THE REPORT

The objective of this report is to provide guidance for meeting the computing needs of students in disciplines other than computing. The specific goals are to:

- Identify a range of courses a computing department may offer for students in other disciplines.

- Advocate that competency in a basic set of computing topics be part of the

college's general education requirement.

- Specify topics that provide the computing knowledge needed by all students in two-year programs, including those who are beginning one of the computing disciplines.

- Recommend a course, and its prerequisites, that covers the essential topics in computing for all students, including those who are beginning one of the computing disciplines.

- Delineate the commitments required of administrators and faculty in order to provide access to, and instruction in, computing for students in other disciplines.

- Recommend the development of an assessment test for student placement in computing courses.

All of these areas are addressed in the following sections of Part I.

No single prescription is given for a set of courses to meet the computing needs of students. Two-year colleges must respond to local conditions and the courses offered must consider community needs. A collection of subject matter modules are included in Part II; they constitute the recommended content for a range of student needs. Each college's faculty can create relevant courses for their students by combining the modules. Several sample courses are specified in Part III to illustrate the process.

## 3.0 EDUCATIONAL GOALS AND CONSIDERATIONS

The two-year college has an important role in preparing its students to use computers effectively in their own disciplines. In our technological society, the level of computing knowledge for a college freshman or sophomore is not the same as it is for a high school student. The two-year college, as well as any other institution of higher education, has a responsibility to provide a higher level of attainment in computing for its traditional students than they obtain in high school. The college must also provide computing instruction commensurate with the needs of its returning adults, both those with no computing experience and those who need to augment their computing experience. These responsibilities to students are shared by administrators and faculty.

## 4.0 BACKGROUND AND NEEDS OF STUDENTS

Public school systems are recognizing the necessity of a general body of computer knowledge for all students. Availability of appropriate equipment and computer trained faculty is improving, but insufficient time to cover all required subjects remains a stumbling block to exposing all secondary school students to computer literacy today. The time may come when every high school graduate will be computer literate. Will that background be sufficient for college students to be successful in their chosen curricula, whatever the disciplines are? Obviously the answer is *no* for students in a computing field who will devote most of their post-secondary study to computers and computing. Our concern is for the students who are in other disciplines. What are the computing needs of that majority of students? What is the responsibility of the two-year college to those students? And what is the expectation of faculty with respect to the computing department?

The Computing for Other Disciplines Committee pursued the answers to these questions in several ways. A search of the literature was done, previous research and relevant surveys were investigated, and a survey was conducted.

### 4.1 Survey of the Literature

The importance that computing and technology have in today's society is reflected in the current literature. A sampling of relevant titles, primarily from journals, is included in the appended bibliography. Articles abound on computer education and the effects of computers in the work place. There are many examples of high interest in computer education from other disciplines. For instance, the thirteenth World Congress on Reading, held in Sweden in 1990, had as its theme, *Literacy Around the World*; one of the aspects of literacy pertained to computing. Computer literacy is a common subject of concern of authors, although it is unusual to find articles directed specifically to two-year college considerations. The literature includes some interest in computing as a part of the general education core for all fields of study, however no definitive statement was found on what would be expected to fulfill the computing requirement.

A search of the literature revealed numerous articles on the growth of computer applications in all aspects of education. Several papers discuss the relationship between use of computers in the classroom and the computing knowledge of

faculty. However, there has been very little literature or research in the area of education and/or training for faculty and students in discipline-specific computing. Two important questions that the literature search left unanswered are:

- What basic computing skills should be required before discipline-specific computing is taught?

- Who should teach the discipline-specific software?

Data on these issues was obtained in the survey discussed in the next section.

## 4.2 Survey of Faculty in Other Disciplines

A survey instrument was developed by the Computing for Other Disciplines Committee and sent to over two hundred faculty members in nearly 50 colleges nationwide. No claim is made for a randomly-generated sample space, however, the respondents came from a wide variety of disciplines as indicated in Table I-1. The rate of return for the survey was an impressive 134 out of 216, or 62%, compared to a typical survey return rate of 20% to 25%. A list of the colleges represented by the respondents is included in Part IV of this report. A summary of the number of responses by discipline is also given in Table I-1.

| **Discipline** | **Number** | **Percent** |
|---|---|---|
| Mathematics | 23 | 17.1% |
| Physical sciences (chemistry, physics, geology, astronomy) | 15 | 11.2% |
| Business (accounting, management, business admin., economics) | 14 | 10.5% |
| Health sciences (nursing, allied health, biological sciences) | 18 | 13.4% |
| Engineering and engineering technology | 12 | 9.0% |
| English and foreign languages | 17 | 12.6% |
| Fine arts (commercial art, music, art, sculpture) | 11 | 8.3% |
| Social sciences (history, psychology, government, education) | 13 | 10.4% |
| Other disciplines | 10 | 7.5% |
| Total surveys returned | 134 | 100.0% |

**Table I-1** **Survey Responses by Discipline**

The survey posed the questions: *What types of software do you use as a part of your classroom presentation?* and, *Which do you require your students to use?*. Table I-2 indicates the percentages of respondents using, or planning to use, the indicated software.

| **Software** | **Class Presentation** | | **Student Use** | |
|---|---|---|---|---|
| | Present | Future | Present | Future |
| Word processor | 41% | 48% | 32% | 47% |
| Spreadsheet | 23% | 32% | 18% | 24% |
| Database | 15% | 24% | 7% | 17% |
| Telecommunications | 6% | 19% | 2% | 16% |
| Statistical packages | 17% | 24% | 9% | 22% |
| Graphics packages | 32% | 57% | 20% | 37% |
| Programming | 14% | 18% | 5% | 11% |
| Discipline specific | 42% | 61% | 45% | 53% |

**Table I-2** **Software Used in Courses**

The survey asked the faculty to rank the statements contained in Figure I-1 on a scale of 1 (strongly disagree) to 5 (strongly agree) with 3 as undecided. Figure I-1 lists the mean average of the responses to each statement:

Students should be trained in effective use of the computer in their specific discipline ..... 4.5

Computing skills unique to my discipline should be taught by faculty in my discipline ..... 4.1

Computing skills unique to my discipline should be integrated into courses in my discipline when and where they are needed..... 4.31

The computer science or computer information systems departments should be the primary source of student computer training..... 2.75

A general education course in computing should be part of every student's degree requirements ..... 3.92

**Figure I-1** **Means of Selected Survey Responses**

The survey also revealed that at the present time, 66 instructors (49% of the respondents) stated their students currently attend a structured laboratory equipped with computers as an integral part of the educational experience; 101 instructors (76% of the respondents) stated their students either currently use a

structured lab or would be required to do so in the future.

As the numbers indicate, many respondents use more than one type of software in their courses. Only 21 out of 134 of those who replied indicated they used no computers at all, either in their classroom presentations or in student requirements. Of those 21, about 50% maintained they would utilize the computer in the future.

The most common computer-related problems cited by the instructors were the lack of computers, equipment, and appropriate software; the lack of financial and administrative support; the students' lack of basic computing skills; and the limited amount of time for computing instruction in a standard class period. Only two respondents maintained that the computer was not appropriate to their discipline.

Faculty in disciplines other than computing see the role of computers in their disciplines increasing over the next ten years. According to their responses, over the next ten years there will more computer use and more reliance on computer capabilities. The software and hardware will be more sophisticated, and both students and faculty will be more familiar with computers.

In summary, the survey indicated a high level of interest from all disciplines in computing and computer applications. Some frequent comments included:

- There is a real need for students to be knowledgeable in computing.
- Students should be taught discipline-specific computing skills by faculty in that discipline.
- Computing skills unique to a discipline should be integrated into courses in that discipline when and where they are needed.
- There should be a computing component in the general education requirements for all students.
- The major constraints to full utilization of the computer in other disciplines include a lack of computing skills, a lack of hardware and software, and inadequate funding and administrative support.
- The most commonly used computer software are discipline-specific software and word processors, followed by graphics, spreadsheets, and statistical packages.
- The power and utility of networks and databases for many disciplines are recognized, but the technologies are not expected to be used until sometime in the future. Many of the discipline-specific packages use databases and networks (for example, medical expert systems), although the practitioners may not recognize the technology under those names.

## 4.3 Current Needs

As we move toward an information-oriented and technology-oriented society, there is an increased need for all educated people to learn not only about computers but also about the technology that is associated with them. The power and capability available to individuals has increased dramatically as the computer's impact on society has expanded. Large collections of data are readily accessible to provide assistance for projects in modelling, analysis, or searching. The computer opens doors to the world through data communications and networking.

Although much of this power is accessible with little knowledge about the systems that support it, effective access is enhanced by an understanding of the fundamental concepts involved. With that understanding, a person can adapt to changes in the technology when they occur. Any educated person, regardless of discipline, needs such a level of knowledge to function effectively in a technologically based society.

## 4.4 Need for a General Education Course in Computing

General education requirements add breadth and background to any discipline in a two-year degree program. The requirements mandate the minimum knowledge, awareness, and skills that all two-year college graduates must possess. Traditionally, core courses in general education have included the areas of written and oral communications, humanities and fine arts, the social sciences, and mathematics and the natural sciences. The combination of courses is intended to provide students with the intellectual skills and conceptual background basic to an understanding of the world, nation, society, and themselves. The focus is not on any particular bodies of knowledge, but is on general modes of understanding. For example, at most colleges, students can satisfy the general education requirement in science by studying any of the natural sciences, as long as they acquire some understanding of the empirical investigation that characterizes science.

A general education program should guarantee mastery of fundamental skills in written English and mathematics. Courses to achieve mastery are usually at the freshman level and are expected to be completed early to serve as a foundation for subsequent work. In today's world, the ability to succeed in college implies more than a mastery of English and mathematics. It also requires using tools, such as computers, that facilitate communication. Before microcomputers

became prevalent, written communication was facilitated by a person transferring a paper document to another person. Searches for data to support written statements were often tedious and not comprehensive, because of the physical difficulties in finding and checking adequate sources.

The situation has changed dramatically in recent years. Computer technology has changed the way people communicate. Paper is no longer the only means of transmitting written material. People using computers with word processing software, can efficiently produce written material and transmit it through disks and electronic mail. In addition, writing skills may be improved with the use of word processing.

Spreadsheet technology can assist in decision making processes. The ability to ask *What if* in many different scenarios, with different subsets of data, from multiple hardware platforms, is a helpful technique in many disciplines. To fully employ such a method, a general understanding of the underlying concepts is beneficial.

Today, computers databases are an important way of storing, maintaining, accessing, and interpreting large volumes of data. Fortunately, user-friendly software has been developed to enable one to easily access and manipulate data, formulate conclusions, and generate statistical summaries. With minimal computing background, one has access to extensive sources of information on databases.

Computer networks have extended a person's communication range. Through electronic mail, one of the facilities made possible by networks, a person can communicate with anyone in the world who also has access to a network. Additional features of networks enable a person to gather information from many sources or access a catalog of information from one source. Electronic communication has become a standard means of obtaining, sharing, and transmitting information.

Word processing, spreadsheets, databases, and networking, along with some facility in computer usage should provide the core knowledge in a general education requirement in computing. Word processing is a necessary tool of communication. Elementary skills in this area may soon be expected of entering college students.

## 5.0 COMPONENTS OF COURSE DESIGN

Some computing courses currently exist for students in other disciplines. These courses were usually developed by computing faculty or by faculty members of the particular discipline. At some institutions there are general computing courses designed for all students.

In order to determine what courses to offer for students from other disciplines, one must first have an understanding of the historical background, the current situation, and future needs. Section 1.0 of this report includes a discussion of course offerings in the past. The next several sections will discuss the evolution of courses from the past into the future.

As computing becomes an integral part of every discipline and profession, the need for a required general education component which is devoted to developing an understanding of computing becomes essential for every college graduate. Section 5.4 contains a discussion of what a general education component might include along with suggestions about possible courses that would provide the component.

## 5.1 The Current Situation

In the 1990's, in addition to word processing, spreadsheets and database packages, the marketplace has been filled with many other software packages that are useful to non-computing discipline. User-friendly features have made learning these packages fairly easy. Application software has become an integral part of many disciplines. For example, mathematics and social sciences use statistical packages; allied health, business, and social sciences use specialized spreadsheets; engineering uses computer-aided design and computer-aided manufacturing (CAD/CAM); and art uses graphics software.

A major trend that continues into the 1990's is a decrease in the number of programming language courses for students in non-computing disciplines. However, the need for language courses is still prevalent. Some engineering, mathematics, or science students profit from courses in FORTRAN or C and some business students should learn COBOL because the work place in those disciplines still maintain programs written in those languages. Some students, especially returning adults, require courses in a language like C or Ada, or one of the fourth-generation languages, to enhance job possibilities. Consequently, some programming language courses should continue to be offered for non-computing majors.

## 5.2 Meeting Future Needs

It is difficult to predict what kind of computing course will be needed in the future by students in non-computing disciplines. Software developers have succeeded in providing application software that is both user friendly and specific to the needs of other disciplines. Consequently, each discipline that uses computers has its own software that is relatively easy to learn and can be taught by faculty in the discipline. Therefore, the responsibility of computing departments to other majors is to present the fundamental computing concepts.

The results of the survey of faculty in other disciplines support these statements. Faculty in other disciplines prefer to incorporate specific computer software packages into their own courses. They also prefer that students come into those courses having a basic understanding of computing.

Faculty in computing must communicate with faculty in other disciplines to determine their needs. When needs are identified that can be met by computing specialists, courses should be developed or revised in consultation with faculty from other disciplines, For example, students from one or more disciplines may

need a general course in computing fundamentals and issues that includes hands-on work with application software or electronic communications. Computing specialists should offer that kind of course, with the understanding that more specific uses will follow in courses in that discipline.

For some computer-related courses in non-computing disciplines, team teaching may be an effective approach. Another possible approach is cluster courses. This concept involves the cooperative development of a computing course and a course in another discipline. Each course would contain topics that complement and support the other and would be taught by a faculty member in the respective discipline. Students would take the two courses concurrently or sequentially.

Computing faculty can help other faculty evaluate or learn new software application packages. They can also give advice about hardware and software acquisitions in courses to support other disciplines. Staff members of the academic computer center might also provide these services.
A highly recommended alternative approach for faculty support and development is to hire an instructional software specialist whose primary job is to work with faculty.

## 5.3 Types of Courses

Many parameters influence the course needs in computing for other disciplines in a two-year college. Some these variables are the local college community, the diversity of the student population, and the wide range of program offerings. Such diversity suggests that a range of topics and courses be prescribed rather than a single course. The choices are a local issue. This report specifies three categories of courses that should be considered and suggests the audiences they would serve. These categories are:

**Applications Software Courses**
The most prevalent kind of computing course for students in non-computing disciplines teaches the use of one or more application software packages. A course in word processing, spreadsheet, and database is typical. A variety of audiences would be interested in a course in desktop publishing and presentation graphics. Other more specific course include graphics software for art, spreadsheets for business, or spreadsheets and statistical packages for social sciences. Sample courses are included in Part III.

Each course should include discussions of related issues, such as ethical concerns, changes in the work place, and effects on the discipline. The course could range in credit hours from one to three, depending on the complexity of the software, the number of features included, the nature of the required projects, the amount of related issues covered, and the expected computing background. An applications software course in this context should be more than training in a specific commercial package. Training in a commercial package might be provided by the continuing education department at the college or a local adult education program.

**Special Courses in Computing**

Courses available in computing curricula include courses in problem-solving techniques or algorithm development which usually precede a first course in programming. Other courses include programming courses in a specific language such as FORTRAN, C, or Ada. The skills gained in these courses can particularly serve the needs of returning adults or students who wish to enhance their employment opportunities. Courses in operating systems such as DOS, UNIX, or VMS, or courses in particular application areas of computing, such as artificial intelligence, expert systems, data communications, information resource management, robotics, security or networking are frequently offered at community colleges. Often, the students seeking these courses include adults with some computing experience who are already in the work force. The nature of the community served by the two-year college will determine which topics or courses are most appropriate. Examples of courses are included in Part III of this report and in other committee reports of the Computing Curricula Task Force.

**A Fundamental Course in Computing**

Another type of course contains material for students in all disciplines. The material provides information about computers and how they can be used to access data, transform data into information, and communicate it to others. Work with application software is included to reinforce concepts and to ensure that students acquire computing experience which may be useful in their non-computing discipline. This type of course also stresses the importance of being able to adapt knowledge about one software package to make use of other similar software packages. The resulting course enhances students' ability to function more effectively within the specific environs of the college and, more generally, within a technological society. This aspect of the course makes it an excellent candidate for a general education course. A specific example of this course is included in

Part III.

Courses of this type serve a very practical purpose relative to computing for other disciplines; they centralize basic education in computing. The following advantages are a result:

- It no longer is necessary for faculty in other disciplines to instruct their students in the use of application software in every course for which it is required.
- Faculty can expect students to have this knowledge as a prerequisite and can present more advanced computing applications appropriate to their disciplines.
- Control over course content is easier to maintain; revisions are easier to implement.
- Students experience more uniform treatment of material than they do when it is included in various courses in many disciplines.
- Students get more in-depth treatment rather than repeated exposure to basics.

## 5.4 A General Education Course for All Students

Computing should be part of the general education requirement of two-year colleges. A knowledge of computing helps every educated person function better in a technological society. Many two-year programs already contain the provision for a computing course as part of a general education requirement. Students should be allowed a choice of ways to meet the requirement: a specified course in a computing discipline, a test designed for the purpose, one of a set of specified computer-oriented courses in a non-computing discipline, or a course designed to meet the requirement.

All graduates of two-year programs should be familiar with the material covered in the five major areas: computer systems, word processing, databases, spreadsheets and networking. This material is selected because it provides the necessary computing concepts, applications, and experience for all students in a two-year program. Such fundamental material should be taught by computing faculty. It forms the foundation for discipline-specific computing that, consistent with the survey results, should be taught by faculty in other disciplines. An example implementation of such a course is included in Part III of this report. It describes a three-credit hour course with a prerequisite that can be met by previous experience or completion of a one-credit hour course. Open (unscheduled) laboratories, in which students are expected to use software tools, are included. Some schools may prefer closed (scheduled) laboratory sessions.

In this case, the course should be offered as a four-credit hour course.

The described course may seem similar to existing courses that give students their first exposure to microcomputers and to word processing, database, and spreadsheet application software. There are considerable differences. While most existing courses stress skill development, the recommended course emphasizes concept understanding. Further, initial experience with microcomputers and word processing is prerequisite to the recommended course, but is usually included in existing courses. Other differences include: computer systems covered in greater depth; databases and spreadsheets from a different approach with more extensive coverage; and more in-depth discussion about networks.

### 5.5 Summary

By the next decade, computers will have permeated all facets of education and society. Knowledge of computing technology will be essential for all educated individuals. Understanding computers and computing software will be a requirement of all two-year college graduates. The essential computing topics will vary from discipline to discipline, but all disciplines will have a common body of computing knowledge.

## 6.0 DEFINITION OF COURSE CONTENT

The computing faculty should provide instruction in the fundamental computing concepts and techniques required by students in other disciplines. More advanced discipline specific use of computers should be provided by that discipline. The material covered by the computing faculty identifies and defines the terminology and computing tools available such as hardware and operating systems; introduces techniques for using general purpose application software; and discusses concepts related to computer systems and application software. Other discipline specific software and hardware should be covered by faculty from that area. As an example, it is appropriate for the computing faculty to cover the use of statistical methods in spreadsheets, but a course that uses statistical software in business applications would be taught by business faculty, and a course on statistics would be taught by the mathematics faculty.

Major areas covering the fundamental computing concepts and techniques, that are considered the responsibility of the computing faculty, are identified in this

section. In Part II, these areas are further subdivided into knowledge units - basic units of material that can be combined to form courses. There are many ways to select a set of knowledge units and then structure a course with them. Sample courses are included in Part III.

The subject areas for computing for other disciplines are the following:

**Computer Systems (CM)**
This subject area is designed to give a broad understanding of the hardware and software components of a microcomputer system, including their interconnections, and their impact on the selection of software for various applications. Included are operating systems and security issues, proper selection and care of equipment and media.

**Database Systems (DB)**
This subject area provides the understanding of database systems needed to manage, access, modify, and control data at both a local and global level. Local data includes relatively small, self controlled, user managed and created data. Larger, global data systems, such as Lexis, are managed and controlled by external services. They may be accessed or queried, but not directly altered, by the user.

**Decision Support and Expert Systems (DS)**
This subject area defines and describes decision support and expert systems, and introduce their application, limitations and ethical implications. Because of the tremendous advances in computational power and software systems, decision support and expert systems have become ever more prevalent.

**Graphics (GR)**
This subject area introduces the wide variety of topics included in computer graphics. Topics include hardware and software requirements, windowing environments and the uses of graphics in simulations, modeling, design and manufacturing, and fine arts.

**Computer Networks (NT)**
This subject area introduces the methods of transmission of data between computing devices. This technology facilitates data access, communications and resources sharing. The ubiquity of electronic access to large databases requires an understanding of this technology. Examples include: banking, inventory control, reservation systems, and

IRS.

**Spreadsheets (SS)**

This subject area provides a fundamental exploration of spreadsheets. Spreadsheet design, problem solving and modeling are included. Use of spreadsheets for sampling, charting and data manipulation are covered. Both procedural and descriptive programming concepts are introduced.

**Statistics in Application Software (ST)**

This subject area provides experience with statistics as it is incorporated into other application software such as spreadsheets.

**Word Processing (WP)**

This subject area emphasizes the development of a working knowledge in using the basic features of a word processing system. A deeper understanding of word processing capabilities is also covered.

## 7.0 RESOURCES

Two-year institutions must provide computing facilities similar to those encountered in local businesses and industries. A coordinated effort of faculty and administrators is necessary to ensure that courses be adapted to meet current needs and backgrounds of students, and that hardware and software reflect the current market situation. Administrators must rely on faculty and, possibly an advisory board, for input before making budget decisions that affect computing facilities.

Periodic review of computing needs is essential. The review should include existing and proposed course offerings for all courses requiring computer use. Both internal and external reviews should be considered. The internal review should be conducted by a representative campus-wide group of personnel. External reviewers should be carefully selected to obtain qualified representatives of education and local industry.

### 7.1 Laboratories

The amount of additional laboratory facilities provided by a two-year college specifically to support computing courses for other disciplines depends on a number of factors. Among them are the kind of facilities that are already in place for other courses offered by both computing and non-computing

departments, and the current demand placed upon the existing facilities. Ready access to up-to-date, commonly-used application software is crucial to maintaining a successful computing laboratory.

Another important factor to be considered when determining laboratory facility needs in computing courses for other disciplines is whether closed or open laboratories are required. Closed laboratories require space, microcomputers, and software to accommodate 20-25 students, with no more than two students at each microcomputer. Also, each instructor should have access to a microcomputer with a monitor or a projection system. It is recommended that the microcomputers be networked, with access to at least one external network. Open laboratories must have application software and networking capabilities for students using the facilities on their own time. Students in courses with closed laboratories also need access to open laboratories.

## 7.2 Faculty and Staff

The number of computing faculty required to offer computing courses for other disciplines depends on the commitment of the institution to having its students prepared in computing. A two-year college with a general education requirement in computing will need more faculty in computing than a college without the requirement. The number also depends on how many other departments rely on the computing faculty to provide basic computing knowledge and skills to their students.

Computing faculty must keep abreast of changes in computing systems and in course and curricula recommendations developed by professional organizations and must transform these changes into implementations appropriate to the student body of the two-year college. Computing faculty must keep their courses current and provide administrators with reasonable estimates of computing facility needs for the courses. Keeping courses current requires communication with faculty in other disciplines. An assessment mechanism to facilitate student placement in computing courses must also be developed and maintained by computing faculty in conjunction with other qualified faculty and staff.

Staff needs center around the laboratories. Open laboratories require monitors as a security measure, and assistants to help students with problems encountered when learning and using application software. Closed laboratories need assistants to support the instructor in providing individual help to students with hands-on work during the laboratory sessions.

### 7.3 Institutional Support

Administrators must ensure that the class size of computing courses for other disciplines is small enough for effective learning. They also must hire and retain both sufficient qualified faculty to offer the course sections and the support personnel to manage and staff the academic computing center and to assist in faculty development. In addition, they must create, maintain and update computer facilities, in terms of both equipment and software. As evidenced by the survey results in Section 4.2, the current lack of administrative support is a major problem for computing in other disciplines.

Computing courses that use applications software should have small class size. These courses have much in common with an English writing course. There must be adequate class time to develop concepts through lecture and discussion, as well as ample time and facility for students to hone their skills in implementing the concepts. In an English writing course, skills are developed through writing outside the classroom and presentations inside the classroom. In the computing course, skills are developed by using application software in the computing laboratory and presenting results in the classroom. Small sections of 20-25 students facilitate the learning process in both kinds of courses.

## 8.0 ISSUES

Two major issues that affect course offerings recommended in this report are entrance and exit competencies in computing expected of students, and the development of an assessment procedure for placement of students into computing courses. Both issues are discussed in this section.

### 8.1 Student Entrance and Exit Requirements

Computing courses developed for two-year college students in other disciplines should assume that students entering a two-year program in any discipline know how to use the basic features of a word processor. Word processing is readily available to anyone with access to a microcomputer. Some amount of training is involved in becoming reasonably proficient in its use, but very little knowledge of computing concepts is required. In some cases, it may be feasible for two-year colleges to offer a prerequisite course so that students can acquire

the necessary capability in word processing, as well as in the basic knowledge of computing systems required in using a word processor.

All graduates of two-year programs should have more than word processing skills. They also need the ability to use other tools, such as spreadsheets, databases, and electronic communication. More importantly, they should have some knowledge about the concepts and issues pertaining to the tools in order to adapt to changes in them, as well as to evaluate and install new versions. They should also be knowledgeable about the broader computer context in which the tools operate.

A two-year college with these entrance criteria and exit goals, will be able to prepare its students for computing in their own disciplines. The students will also be better prepared to function in a technologically-based society. Computing faculty can base their discussions of concepts and issues related to microcomputer systems and applications software on their students' prior knowledge of computing fundamentals. Students will acquire knowledge of concepts, issues, and applications in an integrative way, while they work with the tools.

## 8.2 Assessment for Student Placement

Assessment tests have been developed for placement of students in mathematics and English. Some standardized tests are used, but often tests are local, applying only to the college or school system that developed it. The success rate in placing students in the appropriate courses based on testing varies considerably by college. Among the advantages of placement tests are that they assist student self-assessment; they simplify advising of large numbers of students; and they make advising more consistent.

Development of one or more assessment tests in computing would facilitate advising and placement of students. The computing backgrounds of entering students range over a wide spectrum. A measure that assesses students to place them in computing courses appropriate to their backgrounds, is needed. It would lessen the differences among students in freshman-level computing courses, resulting in more consistent course offerings and greater satisfaction for students and faculty in the courses.

Different assessment tests would determine placement of students in a specific computing course for other disciplines, in a computing discipline course, or in a general education course. Each test should measure a student's competence in

the knowledge required in the specific course.

An assessment test to determine placement of students in a general education course in computing is critical. An assessment test for such a course is considerably more difficult to develop and verify than tests for specific computing courses for other disciplines. A general education course is developed from topics that fulfill a broad-based need in core curriculum. As a required course for college students of all majors, it must provide experiences that enable graduates to develop fully as individuals and to be productive members of society. These experiences include inquiry, logical thinking, and critical analysis. For example, in computing, this experiences may be acquired by learning how operating systems interact with application software so that software can be evaluated, selected, installed, and then used for solving specific problems and communicating with others. The desired level of familiarity can be attained in a general education course such as the one described in Part III of this report.

Efforts in developing assessment tests for student placement can be shared by faculty in colleges in the same system, region, or state. Specific implementations can be reported nationally through media such as the quarterly Bulletin of ACM's Special Interest Group in Computer Science Education (SIGCSE) or the SIGCSE Technical Symposium held annually in February or March.

## 9.0 CONCLUSION

This report provides guidance to computing faculty for the development of courses for students in other disciplines. Recommendations prescribe knowledge units as building blocks for course content. Sample courses are included to illustrate course design based on the knowledge units. Faculty are encouraged to modify these courses to meet their student needs and interests. Communication with faculty in other disciplines and keeping courses current are essential functions of computing faculty.

Results of a survey conducted specifically for this report are included. They provide strong evidence that faculty in other disciplines prefer basic computing knowledge be taught by computing faculty, and that discipline-specific computing be provided by each discipline's faculty. Course recommendations in this report are consistent with this preference.

Adequate and appropriate resources are necessary for the successful offering of courses for students in other disciplines. Assessment tests for placing students in courses should be developed. The general education requirement should include a computing component. These issues are addressed to provide a comprehensive picture of the elements that constitute shared responsibilities between the computing faculty and faculty in other disciplines.

This report was prepared by the Computing for Other Disciplines Committee of the Two-Year College Computing Curricula Task Force of the Association for Computing Machinery. The Steering Committee of the Task Force is appreciative of the many individuals and organizations that supported this curriculum project. A listing of their names appears in the Executive Report of the Task Force.

# PART II

# COURSE KNOWLEDGE UNIT DETAILS

## 1.0 OVERVIEW OF KNOWLEDGE UNITS

This part of the report details the fundamental building blocks for courses, called knowledge units (KU). The format of each knowledge unit is shown in Figure II-1.

| | |
|---|---|
| SUBJECT NAME | **COMPUTER SYSTEMS** |
| KNOWLEDGE UNIT TAG AND NAME | **CM1: MICROCOMPUTER SYSTEM FUNDAMENTALS** |
| DESCRIPTION | A brief overview of the hardware (the computer, keyboard, and memory devices) and peripherals (printers, external storage devices, modems) used in computing. An overview of software concepts pertaining to programming languages and operating systems. |
| TOPICS | Minimum number of hours: 2<br>1. Hardware components<br>2. Memory devices<br>3. Peripherals<br>4. Operating system<br>5. Programming languages<br>6. Application software |
| PREREQUISITE | None |
| REQUISITE FOR | CM2 |

**Figure II-1** **Knowledge Unit Format**

Each of the knowledge units is grouped by *Subject Name*. Each of the subject areas is divided into a set of knowledge units. A *Knowledge Unit Tag and Name* has the following format:

Letter-1 Letter-2 Integer: Knowledge Unit Name

The two letters identify the subject name. A number is used for a numerical ordering of the different knowledge units under a given subject name. Code tags are then identified by a knowledge unit name. For example:

CM1: MICROCOMPUTER SYSTEM FUNDAMENTALS

indicates that the knowledge unit entitled *Microcomputer System Fundamentals* is in the subject area *Computer Systems*, and it is the first in the set of knowledge units for that subject area. The *Description* section contains a synopsis of the particular knowledge unit. The *Topics* section identifies the particular concepts to be addressed. Knowledge units of a given subject area are related to other knowledge units in the same or other subject areas by *Prerequisite* to and *Requisite for* other knowledge units.

## 2.0 SUBJECT AREAS AND RELATED KNOWLEDGE UNITS

Each of the subject areas is defined as a collection of knowledge units. This section contains a listing of the knowledge units within each subject area. Knowledge units are combined to form courses. Part III contains a listing of sample courses made up of these knowledge units.

The knowledge units CM1, CM2, WP1, WP2, and WP3 are *expected background*. With an increased use of computers in grades K through 12, students should be entering college with experience equivalent to these five knowledge units.

The knowledge units within subject areas for computing for other disciplines are the following:

**Computer Systems (CM)**

CM1: Microcomputer System Fundamentals
CM2: File Systems
CM3: Hardware Components

CM4: Evaluating Systems
CM5: Dedicated Systems

**Database Systems (DB)**

DB1: Database System Fundamentals
DB2: Database Models
DB3: Accessing Databases
DB4: Database Ethical Issues

**Decision Support and Expert Systems (DS)**

DS1: Developing Decision Support and Expert System
DS2: Testing and Validating Systems
DS3: Social and Ethical Issues
DS4: Examples and Applications
DS5: Decision Support or Expert System Package

**Graphics (GR)**

GR1: Fundamentals of Graphics
GR2: Equipment and Systems for Graphics
GR3: Using Graphics
GR4: Interactions with Other Software
GR5: Producing Graphics
GR6: Desktop Publishing Package

**Computer Networks (NT)**

NT1: Network Fundamentals
NT2: Network Structures
NT3: Communicating through Networks
NT4: Databases in Networks
NT5: Ethical Issues

**Spreadsheets (SS)**

SS1: Spreadsheet Fundamentals
SS2: Programming Process
SS3: Modifying Data

**Statistics in Application Software (ST)**

ST1: Organizing and Displaying Data
ST2: Descriptive Measures
ST3: Distributions

ST4: Simple Linear Regression
ST5: Statistical Software Package

**Word Processing (WP)**

WP1: Word Processing Fundamentals
WP2: Word Processing as File Processing
WP3: Word Processing Features

## 3.0 DETAILS OF KNOWLEDGE UNITS

This section contains the details of the knowledge units. The knowledge units are listed in the format discussed in Section 1. Single lines are used to separate knowledge units within the same subject area; double lines are used to separate subject areas.

SUBJECT NAME **COMPUTER SYSTEMS**

KNOWLEDGE UNIT TAG AND NAME **CM1: MICROCOMPUTER SYSTEM FUNDAMENTALS**

DESCRIPTION A brief overview of the hardware (the computer, keyboard, and memory devices) and peripherals (printers, external storage devices, modems) used in computing. An overview of software concepts pertaining to programming languages and operating systems.

TOPICS Minimum number of hours: 2
1. Hardware components
2. Memory devices
3. Peripherals
4. Operating system
5. Programming languages
6. Application software

PREREQUISITE None

REQUISITE FOR CM2

---

SUBJECT NAME **COMPUTER SYSTEMS**

KNOWLEDGE UNIT TAG AND NAME **CM2: FILE SYSTEMS**

DESCRIPTION An overview of the basic file system concepts that are essential to using the microcomputer. An examination of the concept of a hierarchical storage system with a study of directories and subdirectories. A discussion of strategies for effective use of such structures.

TOPICS Minimum number of hours: 3
1. Listing, storing, and retrieving files
2. Format, copy, and delete files
3. Directories (listing and deleting files with various parameters)
4. Subdirectories (creating, accessing, removing)
5. Organizational strategies

PREREQUISITE CM1

REQUISITE FOR CM3, DB1, DS1, GR1, NT1, SS1, WP1

---

SUBJECT NAME **COMPUTER SYSTEMS**

KNOWLEDGE UNIT TAG AND NAME **CM3: HARDWARE COMPONENTS**

DESCRIPTION An introduction to the basic features of mass storage media. Implications for database systems.

TOPICS Minimum number of hours: 2

1. Printers
2. Characteristics and usage of auxiliary storage mediums including magnetic tape, magnetic disk, and optical disk
3. Mass storage as part of a computer system
4. Mass storage usage in databases

PREREQUISITES CM2, DB1

REQUISITE FOR CM4, DB3

---

SUBJECT NAME **COMPUTER SYSTEMS**

KNOWLEDGE UNIT TAG AND NAME **CM4: EVALUATING SYSTEMS**

DESCRIPTION An investigation of the influences of operating systems and hardware on software.

TOPICS Minimum number of hours: 2

1. Operating system formats
2. Hardware and software factors
3. Configuration factors
4. Evaluating packages with respect to hardware and software configurations

PREREQUISITE CM3

REQUISITE FOR CM5

---

| | |
|---|---|
| SUBJECT NAME | **COMPUTER SYSTEMS** |
| KNOWLEDGE UNIT TAG AND NAME | **CM5: DEDICATED SYSTEMS** |
| DESCRIPTION | An examination of the basic differences between dedicated and general-purpose systems. |
| TOPICS | Minimum number of hours: 2<br>1. Definition<br>2. Types and examples<br>3. Trade-offs with general purpose systems |
| PREREQUISITE | CM4 |
| REQUISITE FOR | None |

| | |
|---|---|
| SUBJECT NAME | **DATABASE SYSTEMS** |
| KNOWLEDGE UNIT TAG AND NAME | **DB1: DATABASE SYSTEM FUNDAMENTALS** |
| DESCRIPTION | Terminology, applications, and impact of database systems. Basic features of a database management system application package. |
| TOPICS | Minimum number of hours: 4<br>1. Terminology<br>2. Types of databases<br>3. Data file operations |
| PREREQUISITES | CM2 |
| REQUISITE FOR | DB2, CM3 |

SUBJECT NAME **DATABASE SYSTEMS**

KNOWLEDGE UNIT TAG AND NAME **DB2: DATABASE MODELS**

DESCRIPTION Structuring data in different database models.

TOPICS Minimum number of hours: 2
1. Hierarchical
2. Network
3. Relational
4. Object-oriented

PREREQUISITES DB1

REQUISITE FOR DB3, NT4

---

SUBJECT NAME **DATABASE SYSTEMS**

KNOWLEDGE UNIT TAG AND NAME **DB3: ACCESSING DATABASES**

DESCRIPTION Accessing data in different database models. Simple and compound queries.

TOPICS Minimum number of hours: 3
1. Simple queries
2. Queries with logical and relational operators

PREREQUISITES DB2, CM3

REQUISITE FOR DB4, SS3

---

SUBJECT NAME **DATABASE SYSTEMS**

KNOWLEDGE UNIT TAG AND NAME **DB4: DATABASE ETHICAL ISSUES**

DESCRIPTION Discussion of integrity, privacy, and security of personal data in large databases.

TOPICS Minimum number of hours: 2
1. Integrity (How is accuracy of data maintained?)
2. Privacy (Who should be able to access the data?)
3. Security (Who can access the data?)

PREREQUISITES DB3, NT4

REQUISITE FOR DS1

---

SUBJECT NAME **DECISION SUPPORT AND EXPERT SYSTEMS**

KNOWLEDGE UNIT TAG AND NAME **DS1: DEVELOPING DECISION SUPPORT AND EXPERT SYSTEMS**

DESCRIPTION An examination of the basic features and differences in decision support systems and expert systems.

TOPICS Minimum number of hours: 8
1. Components of each system
2. Processing each system
3. Uses of decision support systems vs. expert systems

PREREQUISITE CM2, DB4

REQUISITE FOR DS2

SUBJECT NAME **DECISION SUPPORT AND EXPERT SYSTEMS**

KNOWLEDGE UNIT TAG AND NAME **DS2: TESTING AND VALIDATING SYSTEMS**

DESCRIPTION Importance and methods for testing and validating systems before they are put into practice.

TOPICS Minimum number of hours: 3
1. Testing methods
2. Acceptance of systems

PREREQUISITE DS1

REQUISITE FOR DS3

---

SUBJECT NAME **DECISION SUPPORT AND EXPERT SYSTEMS**

KNOWLEDGE UNIT TAG AND NAME **DS3: SOCIAL AND ETHICAL ISSUES**

DESCRIPTION Emphasis on integrity, security, and supervision of systems due to their societal impact.

TOPICS Minimum number of hours: 3
1. Responsibilities of users
2. People interactions
3. Impact on management
4. Changes caused by systems

PREREQUISITE DS2

REQUISITE FOR DS4

---

SUBJECT NAME **DECISION SUPPORT AND EXPERT SYSTEMS**

KNOWLEDGE UNIT TAG AND NAME **DS4: EXAMPLES AND APPLICATIONS**

DESCRIPTION Survey of the current applications of decision support and expert systems.

TOPICS Minimum number of hours: 3
1. Applications in the medical profession
2. Applications in business
3. Applications in manufacturing
4. Applications in oil exploration
5. Other applications

PREREQUISITE DS3

REQUISITE FOR DS5

---

SUBJECT NAME **DECISION SUPPORT AND EXPERT SYSTEMS**

KNOWLEDGE UNIT TAG AND NAME **DS5: DECISION SUPPORT OR EXPERT SYSTEM PACKAGE**

DESCRIPTION Additional features and uses of a decision support or an expert system software development package.

TOPICS Minimum number of hours: 5
1. Components of software package
2. Package features
3. Package implementation directions
4. Example implementation

PREREQUISITE DS4

REQUISITE FOR None

SUBJECT NAME **GRAPHICS**

KNOWLEDGE UNIT TAG AND NAME **GR1: FUNDAMENTALS OF GRAPHICS**

DESCRIPTION An examination of the basic features and use of graphics software.

TOPICS Minimum number of hours: 6
1. Color codes
2. Character vs. pixel storage
3. Icons
4. Packages vs programming
5. Templates and macros

PREREQUISITE CM2

REQUISITE FOR GR2

---

SUBJECT NAME **GRAPHICS**

KNOWLEDGE UNIT TAG AND NAME **GR2: EQUIPMENT AND SYSTEMS FOR GRAPHICS**

DESCRIPTION Familiarization with the hardware and software to support graphics applications.

TOPICS Minimum number of hours: 2
1. Requirements
2. Characteristics
3. Types available
4. Future possibilities
5. Packages

PREREQUISITE GR1

PREREQUISITE FOR GR3

---

SUBJECT NAME **GRAPHICS**

KNOWLEDGE UNIT TAG AND NAME **GR3: USING GRAPHICS**

DESCRIPTION Survey of the current applications of graphics.

TOPICS Minimum number of hours: 2
1. Fine art
2. Medical imaging
3. Computer-aided design, and computer-aided design and drafting
4. Presentation graphics
5. Film and TV
6. Desktop publishing

PREREQUISITE GR2

REQUISITE FOR GR4, GR5, GR6

---

SUBJECT NAME **GRAPHICS**

KNOWLEDGE UNIT TAG AND NAME **GR4: INTERACTIONS WITH OTHER SOFTWARE**

DESCRIPTION An examination of graphics in specific applications software, especially in window environments.

TOPICS Minimum number of hours: 3
1. Graphs and charts
2. Statistics
3. Word processing
4. Windows

PREREQUISITE GR3, WP2, ST1

REQUISITE FOR None

---

SUBJECT NAME **GRAPHICS**

KNOWLEDGE UNIT TAG AND NAME **GR5: PRODUCING GRAPHICS**

DESCRIPTION An investigation into graphics techniques and methods.

TOPICS Minimum number of hours: 5
1. Animation
2. Scanning and Enhancement
3. Mathematical visualization
4. Recognition systems

PREREQUISITE GR3

REQUISITE FOR None

---

SUBJECT NAME **GRAPHICS**

KNOWLEDGE UNIT TAG AND NAME **GR6: DESKTOP PUBLISHING PACKAGE**

DESCRIPTION An introduction to a commonly-used microcomputer-based desktop publishing package.

TOPICS Minimum number of hours: 11
1. Components of software package
2. Package features
3. Package implementation directions
4. Example implementation

PREREQUISITE GR3

REQUISITE FOR None

SUBJECT NAME **NETWORKS**

KNOWLEDGE UNIT TAG AND NAME **NT1: NETWORK FUNDAMENTALS**

DESCRIPTION Terminology, types, applications, and impact of electronic communications through networks.

TOPICS Minimum number of hours: 3
1. Examples of electronic communications
2. Types of connections, including one to one (serial), many to one (terminals to host), and many to many (local area network - LAN, and wide area network - WAN)
3. Shared resources in networks, such as files, software, databases, printers, and FAX.

PREREQUISITES CM2

REQUISITE FOR NT2

---

SUBJECT NAME **NETWORKS**

KNOWLEDGE UNIT TAG AND NAME **NT2: NETWORK STRUCTURES**

DESCRIPTION Components of different network architectures and their impact in LANs and WANs.

TOPICS Minimum number of hours: 3
1. Topologies of local area networks including bus, ring, and star
2. Media used in local area networks, including coaxial and fiber optic cables
3. Local area network protocols, including token passing and polling
4. Local area network software
5. Integrity and security issues in local area networks
6. Differences between local-area and wide-area networks
7. Problems unique to wide-area networks

PREREQUISITES NT1

REQUISITE FOR NT3

SUBJECT NAME **NETWORKS**

KNOWLEDGE UNIT TAG AND NAME **NT3: COMMUNICATING THROUGH NETWORKS**

DESCRIPTION Sending and receiving information electronically.

TOPICS Minimum number of hours: 3
1. Features and usage of electronic mail
2. Features and usage of bulletin boards

PREREQUISITES NT2

REQUISITE FOR NT4

---

SUBJECT NAME **NETWORKS**

KNOWLEDGE UNIT TAG AND NAME **NT4: DATABASES IN NETWORKS**

DESCRIPTION An investigation of the basic concepts and types of networks that facilitate the movement of large amounts of data between computers. Implications of interconnecting databases.

TOPICS Minimum number of hours: 2
1. Network database fundamentals
2. File servers
3. Database Servers
4. Distributed databases

PREREQUISITES NT3, DB2

REQUISITE FOR DB4, NT5

---

SUBJECT NAME **NETWORKS**

KNOWLEDGE UNIT TAG AND NAME **NT5: ETHICAL ISSUES**

DESCRIPTION Privacy, legal, integrity, and security issues dealing with electronic communications technology.

TOPICS Minimum number of hours: 2
1. Privacy
2. Legal issues
3. Integrity issues
4. Security concerns, including viruses and worms

PREREQUISITES NT4

REQUISITE FOR None

---

SUBJECT NAME **SPREADSHEETS**

KNOWLEDGE UNIT TAG AND NAME **SS1: SPREADSHEET FUNDAMENTALS**

DESCRIPTION An examination of the basic features and uses of a spreadsheet.

TOPICS Minimum number of hours: 6
1. Entering and exiting the spreadsheet system
2. Creating, saving, and retrieving a spreadsheet application
3. Using spreadsheet menus
4. Cells and contents of spreadsheets
5. Spreadsheet variables and functions
6. Editing and printing a spreadsheet application

PREREQUISITES CM2

REQUISITE FOR SS2

SUBJECT NAME **SPREADSHEETS**

KNOWLEDGE UNIT TAG AND NAME **SS2: PROGRAMMING PROCESS**

DESCRIPTION Emphasis on planning the problem solution and the layout of the spreadsheet before entering data into cells.

TOPICS Minimum number of hours: 4
1. Definition, specification and design of spreadsheets
2. Coding, debugging, and testing stages of the implementation process
3. Creating and using macros

PREREQUISITES SS1

REQUISITE FOR SS3, ST1

---

SUBJECT NAME **SPREADSHEETS**

KNOWLEDGE UNIT TAG AND NAME **SS3: MODIFYING DATA**

DESCRIPTION Using advanced features of spreadsheets.

TOPICS Minimum number of hours: 2
1. Exploring alternative ways of processing data
2. Combining and extracting data from files
3. Transforming data into charts and graphs
4. Importing and exporting data

PREREQUISITES SS2, WP2, DB3

REQUISITE FOR ST3

SUBJECT NAME **STATISTICS IN APPLICATION SOFTWARE**

KNOWLEDGE UNIT TAG AND NAME **ST1: ORGANIZING AND DISPLAYING DATA**

DESCRIPTION Fundamental uses of statistics in other application software, such as spreadsheets.

TOPICS Minimum number of hours: 6
1. Data entry
2. Frequency distributions
3. Display data with bar graphs, histograms, and frequency polygons

PREREQUISITE SS2

REQUISITE FOR ST2, GR4

---

SUBJECT NAME **STATISTICS IN APPLICATION SOFTWARE**

KNOWLEDGE UNIT TAG AND NAME **ST2: DESCRIPTIVE MEASURES**

DESCRIPTION Examples of using measures on data displayed through other software packages.

TOPICS Minimum number of hours: 2
1. Measures of center
2. Measures of variation
3. Measures of position

PREREQUISITE ST1

REQUISITE FOR ST3

---

SUBJECT NAME **STATISTICS IN APPLICATION SOFTWARE**

KNOWLEDGE UNIT TAG AND NAME **ST3: DISTRIBUTIONS**

DESCRIPTION Examples of displays of various distributions.

TOPICS Minimum number of hours: 2
1. Uniform distributions
2. Binomial distributions
3. Geometric distributions
4. Hypergeometric distributions
5. Normal distributions

PREREQUISITE ST2, SS3

REQUISITE FOR ST4

---

SUBJECT NAME **STATISTICS IN APPLICATION SOFTWARE**

KNOWLEDGE UNIT TAG AND NAME **ST4: SIMPLE LINEAR REGRESSION**

DESCRIPTION Examples to provide an understanding of the accuracy of data displayed in other software packages.

TOPICS Minimum number of hours: 3
1. Bivalued data entry
2. Scatter diagrams
3. The best fitting line
4. Coefficient of determination
5. Linear correlation

PREREQUISITE ST3

REQUISITE FOR ST5

---

| | |
|---|---|
| SUBJECT NAME | **STATISTICS IN APPLICATION SOFTWARE** |
| KNOWLEDGE UNIT TAG AND NAME | **ST5: STATISTICAL SOFTWARE PACKAGE** |
| DESCRIPTION | An introduction to a commonly-used, microcomputer-based statistical software package. |
| TOPICS | Minimum number of hours: 3<br>1. Components of software package<br>2. Package features<br>3. Package implementation directions<br>4. Example implementation |
| PREREQUISITE | ST4 |
| REQUISITE FOR | None |

| | |
|---|---|
| SUBJECT NAME | **WORD PROCESSING** |
| KNOWLEDGE UNIT TAG AND NAME | **WP1: WORD PROCESSING FUNDAMENTALS** |
| DESCRIPTION | An examination of the basic use of a word processing system as an electronic typewriter. |
| TOPICS | Minimum number of hours: 8<br>1. Entering and exiting the word processing system<br>2. Creating, saving, and retrieving a document<br>3. Use of control keys<br>4. Common function keys<br>5. Editing and printing a document |
| PREREQUISITES | CM2 |
| REQUISITE FOR | WP2, GR4, SS3 |

SUBJECT NAME **WORD PROCESSING**

KNOWLEDGE UNIT TAG AND NAME **WP2: WORD PROCESSING AS FILE PROCESSING**

DESCRIPTION An examination of the methods and techniques of file processing which can be applied in a word processing system.

TOPICS Minimum number of hours: 2
1. Interfacing files, including merging, appending, and importing of text and graphics
2. Transferring files between systems
3. Standardization of computer character codes
4. Inherent problems in transferring files

PREREQUISITES WP1

REQUISITE FOR WP3

---

SUBJECT NAME **WORD PROCESSING**

KNOWLEDGE UNIT TAG AND NAME **WP3: WORD PROCESSING FEATURES**

DESCRIPTION Exploration of word processing system capabilities that facilitate writing.

TOPICS Minimum number of hours: 4
1. Adapting to individual styles
2. Marking text for outlining and for table of contents
3. Footnotes and endnotes
4. Thesaurus and spell checker

PREREQUISITES WP2

REQUISITE FOR None

# PART III

# SAMPLE COURSE IMPLEMENTATIONS

## 1.0 OVERVIEW

Many variables influence the course needs in computing for other disciplines in a two-year college. It is the purpose of this report to allow individual colleges to develop their own courses based upon the prescribed set of knowledge units. Flexibility is essential to ensure the recommendations of this report do not conflict with the character and mission of each institution.

Section 2 contains a sampling of the kind of courses that can be developed from the knowledge units identified in Part II. The descriptions of the following courses are included: a course for all students which could be used to fulfill a general education requirement, a course for students in the graphic arts or humanities, a course for students in business or social sciences, and a course for students in business, psychology, or allied health.

Section 3 contains references to courses in reports of other committees of the ACM Two-Year College Computing Curricula Task Force. Some of these courses might be appropriate for students in disciplines such as mathematics, the sciences, and engineering, or for the returning adult student in need of upgrading their work-related computing skills.

## 2.0 COMPUTING FOR OTHER DISCIPLINES SAMPLE COURSES

This section contains the descriptions of four courses which a computing department may offer for students in disciplines other than computing. Each course description is based on the following assumptions: a semester-based system of fifteen weeks, three contact hours per week, and three credit hours. Open laboratories should be part of each course. Closed (scheduled) laboratories could also enhance each course, but they are a local option because of the space

and equipment requirements involved. Two-year colleges that are able to implement closed laboratories for any of the courses should consider a four credit-hour course offering.

Each course has a prerequisite consisting of a computing background equivalent to all or part of the five knowledge units CM1 (Microcomputer System Fundamentals), CM2 (File Systems), WP1 (Word Processing Fundamentals), WP2 (Word Processing as File Processing), and WP3 (Word Processing Features). Most students entering a two-year college directly from high school will already have had at least this background in computing. Adult students returning to school, as well as some students matriculating from secondary schools, may not have had the opportunity to acquire sufficient background in word processing and microcomputer systems. To accommodate students who lack the prerequisite background, two-year colleges should offer a remedial course or set up tutorial services to help students acquire the necessary prerequisite background. The remedial course should include scheduled (closed) laboratories for instruction and hands-on exercises, since the students will be inexperienced in computer usage.

Sample descriptions of the following course are included in this section:

**COD 1 Computer Communications**
This is a course for all students that could be used to fulfill a general education requirement. This course is designed to enhance a student's ability to function in a complex, technologically-oriented society.

**COD 2 Desktop Publishing**
This is a course for students in the graphic arts or humanities.

**COD 3 Computing and Statistics**
This is a course for students in business or social sciences.

**COD 4 Decision Support and Expert Systems**
This is a course for students in business, psychology, or allied health.

The computing topics in COD 1 are selected to enhance the ability of two-year college graduates to communicate with other people, through the use of computers and applications software. Students learn about and experience three types of interaction: people-to-people, people-to-computer, and computer-to-computer. Effective computer communication requires more than experience using applications software such as spreadsheets and databases. It also requires knowledge of underlying concepts and capacity for integrative discussions so that solid foundations are laid for adaptation to change, such as learning new applications software or updates to existing packages. Concepts are

reinforced with practical examples and applications software.

In Courses COD 2 through COD 4, content specifications assume that the general education course COD 1 is not a prerequisite. If any of the courses COD 2 through COD 4 is offered with a prerequisite of COD 1, then changes must be made to the course content.

Some two-year colleges may be able to offer special sections of the COD 1 course for one or more designated disciplines. The course could be customized for the disciplines by substituting knowledge units, or giving less emphasis to some knowledge units to allow additional time for other knowledge units or for additional material.

The descriptions of each of the courses include the following components:

**Course Title**
A clear but brief name of the course with course code or number is provided.

**Audience**
This is the group of students for whom the course is targeted.

**Prerequisites**
Courses are listed which must be completed prior to taking the course being described.

**Goal or Purpose of the Course**
This is a short paragraph expressing what the course should accomplish.

**Behavioral Objectives for Students**
This part contains a listing of the competencies expected from students who successfully complete the course.

**Subject Matter**
This part contains a table with two columns containing the knowledge unit tag, and the minimum number of lecture hours required for the knowledge unit.

**Activities**
This part contains suggestions for student activities appropriate for the course. These activities may be conducted in class, assigned for homework, conducted in a closed laboratory setting, or assigned for an open laboratory setting.

## COD 1 Computer Communications

Audience:
All students. This course can be considered as one of the ways to fulfill a general education requirement in computing.

Prerequisite:
Students should be expected to have at least the following computing background:

1. Knowledge of microcomputer operating system fundamentals (knowledge unit CM1),
2. Basic experience in file manipulation (knowledge unit CM2),
3. Experience with a specific word processing package (knowledge units WP1-WP3).

Goal:
An introduction to basic concepts, tools, and techniques for using the computer effectively to enhance a student's ability to communicate.

Objectives:
Upon completion of this course, a student will be able to:

- Prepare a text-processed report containing a summary of data from a database or a spreadsheet, and transmit the report by e-mail.
- Manipulate data in a large data file.
- Establish a communication link with another computer.
- Send and retrieve a message over a network.
- List the questions an individual should ask before purchasing a microcomputer system or applications software.
- Evaluate different versions of software packages for a specified application.
- Install application software packages or updates to already installed packages.
- Discuss several major ethical issues inherent in the use of large databases and networks.
- Develop and program a spreadsheet to communicate a problem solution.
- Evaluate the impact of word processing, e-mail, and networking on the student, college, community, and work place.

Subject Matter:

| KU Tag | Number of Hours |
|---|---|
| NT1 | 3 |
| NT2 | 3 |
| NT3 | 3 |
| NT4 | 2 |
| NT5 | 2 |
| CM3 | 2 |
| CM4 | 2 |
| CM5 | 2 |
| SS1 | 6 |
| SS2 | 4 |
| SS3 | 2 |
| DB1 | 4 |
| DB2 | 2 |
| DB3 | 3 |
| DB4 | 2 |

Activities

- Evaluate a software package for a given hardware and software environment, or evaluate a different software package than used in the course.
- Use a database management software package to create, modify and query a database, such as a computerized card catalog in a library.
- Research new technology in popular scientific publications.
- Determine how a local bank stores and accesses data.
- Report on your efforts to access and change a record in a large database containing personal data.
- Report on a publicized breach of privacy or security in a large database or network, including its impact.
- Report on how a LAN or WAN has changed the communications within an office or company.
- Explain how a computer worm or virus works.
- Use a LAN or WAN to communicate with someone on another WAN.
- Display a pie or bar chart showing demographic data of people in your county.
- Develop a spreadsheet application in your intended major.

## COD 2 Desktop Publishing

Audience:
Students in graphic arts, humanities.

Prerequisite:
Knowledge units CM1, CM2, WP1, WP2, and WP3

Goal:
Text processing and graphics concepts, tools, and techniques. Use of a specific applications software package designed for desktop publishing.

Objectives:
Upon successful completion of the course, the student should be able to:

- Evaluate word processing, graphics, and desktop publishing software packages.
- Proof read and edit text.
- Produce an illustrated newsletter.
- Understand differences between creating graphics and using graphics that are part of a software package.

Subject Matter:

| KU Tag | Number of Hours |
|---|---|
| CM1 | 1 (Optional Review) |
| CM2 | 2 (Optional Review) |
| WP1 | 2 (Optional Review) |
| WP2 | 1 (Optional Review) |
| WP3 | 2 (Optional Review) |
| CM4 | 2 |
| CM5 | 2 |
| GR1 | 6 |
| GR2 | 2 |
| GR3 | 3 |
| GR4 | 3 |
| GR5 | 5 |
| GR6 | 11 |

Activities:

- Explore the distinctions between a graphical or windowing environment and a textual environment.
- Design and implement an advertisement or newsletter containing both text and graphics.

## COD 3 Computing and Statistics

Audience:
Students in business, social sciences.

Prerequisite:
The equivalent material in knowledge units CM1 and CM2.

Goal:
Concepts, tools, and techniques for integrating graphics and statistical methods with spreadsheets. Use of a specific statistical applications software package.

Objectives:
Upon successful completion of the course, the student should be able to:

- Display basic statistical distributions of data in a spreadsheet.
- Develop a spreadsheet for a business-oriented application.
- Use graphics, a spreadsheet, and a statistical package to display data.

Subject Matter:

| KU Tag | Number of Hours |
|---|---|
| CM1 | 1 (Optional Review) |
| CM2 | 2 (Optional Review) |
| GR1 | 6 |
| GR2 | 2 |
| GR4 | 3 |
| SS1 | 6 |
| SS2 | 4 |
| SS3 | 2 |
| ST1 | 6 |
| ST2 | 2 |
| ST3 | 2 |
| ST4 | 3 |
| ST5 | 3 |

Activities:

- Given SAT scores of entering freshmen, display them and discuss statistical measures and distributions related to them.
- Develop and maintain a departmental budget for a five year period. Display the effects of various increases or decreases.

## COD 4 Decision Support and Expert Systems

Audience:
Students in business, psychology, allied health.

Prerequisite:
The equivalent material in knowledge units CM1 and CM2.

Goal:
Introduction to basic concepts and applications of databases, decision support systems, expert systems. Use of applications software packages.

Objectives:
Upon successful completion of the course, the student should be able to:

- Understand the functions of, and differences among, a database, a decision support system, and an expert system.
- Use a decision support or expert system software package.
- Explain social and ethical implications of misuse of an expert system.

Subject Matter:

| KU Tag | Number of Hours |
|---|---|
| CM1 | 1 (Optional Review) |
| CM2 | 2 (Optional Review) |
| CM3 | 2 |
| CM4 | 2 |
| CM5 | 2 |
| DB1 | 4 |
| DB2 | 2 |
| DB3 | 3 |
| DB4 | 2 |
| DS1 | 8 |
| DS2 | 3 |
| DS3 | 3 |
| DS4 | 3 |
| DS5 | 5 |

Activities:

- Report on a decision support or expert system used in business, psychology, or allied health. Compare its use and effectiveness with the system or method it replaced.
- Determine the extent to which decision support and expert systems are used in the United States.

## 3.0 COURSES FROM REPORTS OF OTHER TASK FORCE COMMITTEES

The reports of other committees of the Two-Year College Computing Curricula Task Force contain courses that are appropriate for students in non-computing disciplines. The beginning courses of the following reports contain subject matter that would be suitable for students with appropriate background and interests: computing sciences, computing for information processing, and computer support services. The titles, prerequisites, and brief descriptions of these courses are included in this section, along with comments on potential audiences for the courses. In addition, some of the courses identified in the *Service Courses* section of the reports may be appropriate for returning adults in need of upgrading their computing background for work-related needs. Complete details of all these courses may be found in the report of the particular committee of the Task Force.

### 3.1 A Course From the CS Committee Report

The following course is included in the report of the Computing Sciences Committee. It is the first computing course required of all computing sciences majors.

**CS 101 Computing Fundamentals I** Lecture (3:3)
Laboratory (1:3)

Audience:
Students in engineering, mathematics, and the sciences.

Prerequisite:
Precalculus mathematics and an introduction to structured programming concepts.

Goal:
This course provides the essential foundation for a program of study in computing science. It introduces the discipline of computing science and the roles of professionals. It integrates an introduction to algorithm design, an understanding of abstraction applied to data types and structures, and an appreciation of a programming language as a means of describing algorithms and data structures. The course introduces searching and sorting algorithms, file systems, and object-oriented programming.

Comments:

The subject matter of the course CS 101 will enhance a student's problem solving and programming abilities, as well as give a fundamental understanding of societal issues related to computing and the roles of the computing sciences professionals. This course is essential for any student who is considering computer science as a field of study to complement their major field.

## 3.2 Courses From the CIP Committee Report

The following courses are included in the report of the Computing for Information Processing Committee. These are the first two computing courses required of all computing for information processing majors. CIP 1 emphasizes productivity tools, and CIP 2 emphasizes algorithm development and problem-solving strategies with a programming language.

**CIP 1 Introduction to Computing for Information Processing** Lecture (3:3) Laboratory (1:2)

Audience:
Students in business and the social sciences.

Prerequisite:
Computer literacy or equivalent

Goal:
This course provides understanding of the variety of configurations, and the capabilities and limitations of computer-based systems. It also uses productivity tools to develop simple applications.

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**CIP 2 Introduction to Programming for Information Processing** Lecture (2:2) Laboratory (1:2)

Audience:
Students in business and the social sciences.

Prerequisite:
Computer literacy or equivalent, high school algebra, programming experience desired

Goal:
This course introduces problem solving strategies, algorithm development and verification. It also emphasizes problem solving methods, algorithm design, and implementation and testing solutions using a procedural programming language in a business context.

Comments:
These courses may be appropriate for students in business or social studies, especially those who are interested in complementing their majors with additional courses in computing. Because of the broad coverage of topics in CIP

1, including introductions to applications software and societal impacts, this course could be considered as one alternative for fulfilling a general education requirement in computing.

## 3.3 A Course From the CSS Committee Report

The following course is included in the report of the Computer Support Services Committee. This is the first computing course required of all computer support services majors.

### CSS INTRO Introduction to Computer Support Services

Audience:
Students in any discipline.

Prerequisite:
None.

Goal:
This course introduces hardware, operating systems, standard application software, and networking. The course is designed to be the cornerstone of the curriculum.

Comments:
Topics in CSS INTRO are similar to the topics in COD 1 - Computer Communication, described above, but the treatment of the topics is considerably different. Compared to COD 1, CSS INTRO includes more emphasis on hardware, including its interdependence with software, and a more introductory treatment of software packages. CSS INTRO is appropriate for students in any discipline who want an introduction to computer systems, networking and applications software, but who may not have the background prerequisite for COD 1.

# PART IV

# SUPPORTIVE INFORMATION

## BIBLIOGRAPHY

Allison, Cathy. Education II: Good News, Bad News. *Computing Canada* 17, 18 (Sept 2, 1991), 41.

Allum, Keith F. School-College Partnerships and Educational Innovation. *Educational Technology*, 31, 7 (July, 1991), 7.

Bull, Glen. et. al. Building an Electronic Village. *Educational Technology* 31, 4, (April, 1991), 30.

Currid, Cheryl. Inspiring Educators Turn Obstacles into Incentives. *PC Week* 7, 14 (April 9, 1990), 127.

Dellow, D. Computer Literacy: A 21st Century Debate. *Electronic Education* 4, 4, (Jan, 1985), 24-25.

Doucette, Don. The Community College and the Computer: Behind Widespread Integration into Instruction. *Academic Computing* 4, 5 (Feb, 1990), 12-14.

Ekins, Roger Robin. Computer Illiterate and Proud of It. *Community and Junior College Journal* 56, 2 (Oct-Nov, 1989), 28-31.

Fredericks, A.D. For Hire: Community College Computer Instructor. *Electronic Learning* 4, 5 (Feb, 1985), 30.

Greene, Benjamin B. Jr. A Survey of Computer Integration Into College Courses. *Educational Technology* 31, 7, (July, 1991), 37.

Hardiman, Barbara. Teaching Developmental Mathematics: the Interactive Videodisc Approach. *T.H.E. Journal*, 17, 8 (April, 1990), 63.

Hills, Alex. Teaching Information Networking. *IEEE Spectrum*, 28, 10 (Oct, 1991), 22.

Holusha, John (1991). Businesses Go Back To School; Community Colleges Bring High Technology to the Shop Floor. *New York Times* 141 (Nov 3,1991).

Jones, Warren T. & McGuirt, Mike F. Telecommunications and Computer

Science: Two Merging Paradigms. *ACM/SIGCSE Bulletin*, 23, 4 (1990), 13-23.

Kuhn, David J. A Study of the Attitudes of Female Adults toward Computers. *Community/Junior College Quarterly of Research and Practice* 13, 3-4 (1989), 181-189.

Molloy, Maureen. College Net Draws Students for Unique Degree Program. *Network World* 7,51 (Dec 17, 1990), 27.

Penrose, Roger. *The Emperor's New Mind*. Oxford University Press, N.Y. (1989).

Pierce, Charlotte. That Which is Right in Writing. *Home Office Computing*, 9, 1 (Jan, 1991), 12.

Rentz, William D. & Bailey, Charles. An Adult Literacy Program Gains Successes in North Carolina. *T.H.E. Journal*, 18, 8 (March, 1991), 70-72.

(No Author indicated) L.A. Office of Education Grows Voice/Data Network. *Communication News*, 28, 7 (July 1991), 8.

**SURVEY INSTRUMENT AND SUMMARY OF SURVEY**

ASSOCIATION FOR COMPUTING MACHINERY (ACM)
TWO YEAR COLLEGE
COMPUTING CURRICULA TASK FORCE

Computing for Other Disciplines Committee
Survey of Computing Use in Disciplines

*Surveys Mailed: 216* *Surveys Returned: 134*

*(Strongly Agree = 5, Agree = 4, Undecided = 3, Disagree = 2, Strongly Disagree = 1)*

**1. Students should be trained in effective use of the computer in their specific discipline.**

| *Number of Responses* | *Strongly Agree* | *Agree* | *Undecided* | *Disagree* | *Strongly Disagree* | *Mean* |
|---|---|---|---|---|---|---|
| *134* | *82* | *44* | *4* | *4* | *0* | *4.5* |

**2. Computers make instruction easier.**

| *Number of Responses* | *Strongly Agree* | *Agree* | *Undecided* | *Disagree* | *Strongly Disagree* | *Mean* |
|---|---|---|---|---|---|---|
| *134* | *23* | *63* | *34* | *13* | *1* | *3.7* |

**3. The computer science or computer information systems departments should be the primary source of student computer training.**

| *Number of Responses* | *Strongly Agree* | *Agree* | *Undecided* | *Disagree* | *Strongly Disagree* | *Mean* |
|---|---|---|---|---|---|---|
| *134* | *11* | *34* | *19* | *53* | *17* | *2.75* |

**4. Students should be required to have basic computing skills before they use discipline specific software in my classes.**

| *Number of Responses* | *Strongly Agree* | *Agree* | *Undecided* | *Disagree* | *Strongly Disagree* | *Mean* |
|---|---|---|---|---|---|---|
| *133* | *15* | *46* | *17* | *46* | *8* | *3.1* |

**5. Computing skills unique to my discipline should be taught by faculty in my discipline.**

| *Number of Responses* | *Strongly Agree* | *Agree* | *Undecided* | *Disagree* | *Strongly Disagree* | *Mean* |
|---|---|---|---|---|---|---|
| *133* | *46* | *57* | *18* | *10* | *1* | *4.05* |

**6. Computing skills unique to my discipline should be integrated into courses in my discipline when and where they are needed.**

| *Number of Responses* | *Strongly Agree* | *Agree* | *Undecided* | *Disagree* | *Strongly Disagree* | *Mean* |
|---|---|---|---|---|---|---|
| *133* | *52* | *73* | *4* | *2* | *1* | *4.31* |

**7. Knowledge of <u>computer operating systems</u> is necessary for students in my discipline.**

| *Number of Responses* | *Strongly Agree* | *Agree* | *Undecided* | *Disagree* | *Strongly Disagree* | *Mean* |
|---|---|---|---|---|---|---|
| *133* | *11* | *32* | *11* | *60* | *18* | *2.62* |

**8. Knowledge of <u>word processing</u> is necessary for students in my discipline.**

| *Number of Responses* | *Strongly Agree* | *Agree* | *Undecided* | *Disagree* | *Strongly Disagree* | *Mean* |
|---|---|---|---|---|---|---|
| *134* | *29* | *58* | *8* | *27* | *11* | *3.5* |

**9. Knowledge of <u>data base packages</u> is necessary for students in my discipline.**

| *Number of Responses* | *Strongly Agree* | *Agree* | *Undecided* | *Disagree* | *Strongly Disagree* | *Mean* |
|---|---|---|---|---|---|---|
| *133* | *5* | *35* | *28* | *54* | *10* | *2.78* |

**10. Knowledge of <u>spreadsheets</u> is necessary for students in my discipline.**

| *Number of Responses* | *Strongly Agree* | *Agree* | *Undecided* | *Disagree* | *Strongly Disagree* |
|---|---|---|---|---|---|

| | | | | | | Mean |
|---|---|---|---|---|---|---|
| *132* | *15* | *22* | *33* | *50* | *11* | *2.82* |

**11. Knowledge of <u>electronic communications</u> is necessary for students in my discipline.**

| *Number of Responses* | *Strongly Agree* | *Agree* | *Undecided* | *Disagree* | *Strongly Disagree* | *Mean* |
|---|---|---|---|---|---|---|
| *134* | *11* | *35* | *23* | *51* | *13* | *2.84* |

**12. Knowledge of <u>graphic packages</u> is necessary for students in my discipline.**

| *Number of Responses* | *Strongly Agree* | *Agree* | *Undecided* | *Disagree* | *Strongly Disagree* | *Mean* |
|---|---|---|---|---|---|---|
| *133* | *18* | *42* | *26* | *37* | *9* | *3.17* |

**13. Knowledge of <u>programming languages</u> is necessary for students in my discipline.**

| *Number of Responses* | *Strongly Agree* | *Agree* | *Undecided* | *Disagree* | *Strongly Disagree* | *Mean* |
|---|---|---|---|---|---|---|
| *134* | *10* | *17* | *15* | *69* | *22* | *2.42* |

**14. Computers should be an integral part of every course.**

| *Number of Responses* | *Strongly Agree* | *Agree* | *Undecided* | *Disagree* | *Strongly Disagree* | *Mean* |
|---|---|---|---|---|---|---|
| *126* | *18* | *36* | *20* | *42* | *9* | *3.1* |

**15. Computers are an integral part of every course I teach.**

| *Number of Responses* | *Strongly Agree* | *Agree* | *Undecided* | *Disagree* | *Strongly Disagree* | *Mean* |
|---|---|---|---|---|---|---|
| *124* | *14* | *23* | *11* | *61* | *14* | *2.7* |

**16. There are some courses for which computers are not appropriate.**

| Number of Responses | Strongly Agree | Agree | Undecided | Disagree | Strongly Disagree | Mean |
|---|---|---|---|---|---|---|
| 125 | 28 | 44 | 29 | 22 | 1 | 3.61 |

**17. Computers use will improve a student's problem solving skills.**

| Number of Responses | Strongly Agree | Agree | Undecided | Disagree | Strongly Disagree | Mean |
|---|---|---|---|---|---|---|
| 123 | 14 | 57 | 37 | 14 | 1 | 3.56 |

**18. Student computing use will increase his/her understanding of a course.**

| Number of Responses | Strongly Agree | Agree | Undecided | Disagree | Strongly Disagree | Mean |
|---|---|---|---|---|---|---|
| 125 | 15 | 60 | 39 | 10 | 1 | 3.62 |

**19. A general education course in computing should be part of every student's degree requirements.**

| Number of Responses | Strongly Agree | Agree | Undecided | Disagree | Strongly Disagree | Mean |
|---|---|---|---|---|---|---|
| 127 | 39 | 57 | 17 | 10 | 4 | 3.92 |

**20. How many hours per week do your students use a computer to complete assignments in your class?**

| | Less than 1 | 2 - 5 | 6 - 10 | 11 - 15 | 16 - 20 | More than 20 |
|---|---|---|---|---|---|---|
| Responses: | 0 | 55 | 51 | 16 | 2 | 1 |

**21. Do your students attend a structured lab with computers an integral part of the educational experience?**

***NOW***: _65__YES __65_ NO (no response: 4)

***IN THE FUTURE***: _101_YES __19_NO (No response: 14)22.

**Which of the following do you use as a part of your classroom presentations? (check all that apply)**

| **Present** | **Future (2000 AD)** | *(The numbers in the "Future" column indicate responders not included in "Present" column.)* |
|---|---|---|
| *__55_* | *___10___* | *word processor* |
| *__30_* | *___13___* | *spreadsheet* |
| *__20_* | *___12___* | *data base* |
| *___8_* | *___17___* | *telecommunications* |
| *__22_* | *___10___* | *statistical packages* |
| *__43__* | *___25___* | *graphics packages* |
| *__19__* | *____5___* | *programming languages* |
| *__56__* | *___26___* | *discipline specific* |

*software(titles)*_____

**23. Which of the following do you require your students to use? ( check all that apply )**

| **Present** | **Future (2000 AD)** | |
|---|---|---|
| *__43_* | *___19___* | *word processor* |
| *__21_* | *___11___* | *spreadsheet* |
| *___9_* | *___13___* | *data base* |
| *___3_* | *___18___* | *telecommunications* |
| *__12_* | *___17___* | *statistical packages* |
| *__26__* | *___23___* | *graphics packages* |
| *___7__* | *____8___* | *programming languages* |
| *__60__* | *___26___* | *discipline specific* |

*software(titles)*_____

**24. The biggest problem for student use of computers in my discipline is:**

**25. How will the role of computers in your discipline change in the next ten years?**

**COLLEGES AND STATES OF RESPONDENTS TO SURVEY**

| College | State |
|---|---|
| Amarillo College | Texas |
| Bellevue Community College | Washington |
| Brevard Community College | Florida |
| Cabrillo College | California |
| Central Piedmont Community College | North Carolina |
| Clackamas Community College | Oregon |
| DeKalb Technical Institute | Georgia |
| Elgin Community College | Illinois |
| Embry-Riddle Aeronautical University | Arizona |
| Florida Community College at Jacksonville | Florida |
| Gainsville College | Georgia |
| Gordon Junior College | Georgia |
| Greenville Technical College | South Carolina |
| Hofstra University | New York |
| Jamestown Community College | New York |
| Long Beach City College | California |
| Manatee Community College | Florida |
| Maysville Community College | Kentucky |
| McLennan Community College | Texas |
| Montgomery College | Maryland |
| Mott College | Michigan |
| Mount Hood Community College | Oregon |
| North Lake Community College | Texas |
| Oklahoma City Community College | Oklahoma |
| Pensacola Junior College | Florida |
| Portland Community College | Oregon |
| Rogers State College | Oklahoma |
| St. Petersburg Junior College | Florida |
| Tallahassee Community College | Florida |
| William Rainey Harper College | Illinois |

**Table IV-1** **Survey Demographics**

## KNOWLEDGE UNIT INDEX

## COURSE INDEX