INTRODUCTION

The use of computers in business is increasing dramatically, both in the diversity of applications and in the number of smaller firms now employing them. Hence, one would expect a corresponding increase in the number and extent of combined business/computer science programs in undergraduate college and university curricula. In an effort to explore this increase, and to provide one resource for their work on a combined program at California State University, Chico, the authors did a survey of such programs in the United States. This paper is a report on the results of that survey.

METHODOLOGY

The survey was conducted during the 1976-77 academic year. Program directories, departmental brochures, catalogs, professional journals, mail inquiries, and personal discussions were used to compile an initial “candidate” list of schools and their programs.

Sub-minimal crossovers were eliminated during this compilation; “minimal” was arbitrarily taken to mean “a combined program in which the degree area required at least 75 percent of the units normally required for a minor in the other area;” e.g., if a typical minor was 20 units, then a business program which required fewer than 15 units of computer-related courses was considered sub-minimal.

As indicated above, this cutoff was arbitrary. It was unfortunately necessitated after initial work indicated a very large candidate list, but one in which a significant number of supposedly combined programs required only two or three courses in the non-degree area.

It is interesting to note that during the search process the perspective of the survey changed. It was originally intended to have two aspects: computer science majors with business options and business majors with computer science options. However, the authors were able to identify very few of the former; hence, the focus is on the latter.

After compilation of the candidate list, work was begun on an in-depth analysis of each program and the courses in it. At this stage some programs were unfortunately dropped from consideration because precise requirements and/or descriptions for course numbers were not available in time. The final sample consisted of 56 schools offering a business degree with a minimal option in computer science.

Results were tabulated according to a course list derived from the union of all the samples’ courses. Since emphasis here is mainly on content rather than quantified amounts, it was decided not to distinguish between quarters, semesters, 4-1-4, etc. Similarly, only two status categories were used: required and elective. Required courses are those explicitly and individually specified. Elective courses comprise all others, including such listings as “select two of the following six,” etc.

The percentage of schools having each course required, elective, and either required or elective is shown in Appendix I. Appendix II is a selection of those courses most often required. Finally, Appendix III shows several of the more comprehensive programs.

COMMENTS

It must be stressed that the fundamental orientation of this survey has been the general composition of computer science options in business curricula. Ideally, of course, an advisor from every school would have been interviewed with regard to the program in his/her department. Limited resources, time constraints, and the number of programs involved made this impossible. Therefore, although every possible effort was expended to insure accuracy and completeness, no claims can be made as to the inclusion of all programs or the exact specification of programs included.

The survey results have proven very useful for the authors’ purposes. It should be of similar use for others designing combined programs.

In closing, two sidelights were of interest to the authors. First, the large number of courses coupled with the small percentage of schools requiring many of these courses seems to indicate considerable diversity of opinion as to which topics should be part of such a program. Second, the topic “security” was automatically entered at the start of the tabulations. Given the concern with computer crimes and abuses, it was surprising to find that none of the programs included a course in security as either a requirement or elective.
APPENDIX I—REQUIRED AND ELECTIVE PERCENTAGES

<table>
<thead>
<tr>
<th>I. Introduction and Languages</th>
<th>REQUIRED</th>
<th>ELECTIVE</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Introduction to computers</td>
<td>85.7</td>
<td>1.8</td>
<td>87.5</td>
</tr>
<tr>
<td>2. Flowcharting</td>
<td>3.6</td>
<td></td>
<td>3.6</td>
</tr>
<tr>
<td>3. Documentation</td>
<td>1.8</td>
<td></td>
<td>1.8</td>
</tr>
<tr>
<td>4. Basic</td>
<td>1.8</td>
<td></td>
<td>1.8</td>
</tr>
<tr>
<td>5. FORTRAN I</td>
<td>37.5</td>
<td>3.6</td>
<td>41.1</td>
</tr>
<tr>
<td>6. FORTRAN II</td>
<td>5.4</td>
<td>3.6</td>
<td>8.9</td>
</tr>
<tr>
<td>7. R.P.G.</td>
<td>8.9</td>
<td></td>
<td>8.9</td>
</tr>
<tr>
<td>8. COBOL I</td>
<td>51.8</td>
<td>7.1</td>
<td>58.9</td>
</tr>
<tr>
<td>9. COBOL II</td>
<td>10.7</td>
<td>5.4</td>
<td>16.1</td>
</tr>
<tr>
<td>10. PL/I</td>
<td>7.1</td>
<td>3.6</td>
<td>10.7</td>
</tr>
<tr>
<td>11. Assembly I</td>
<td>30.4</td>
<td>8.9</td>
<td>39.3</td>
</tr>
<tr>
<td>12. Assembly II</td>
<td>1.8</td>
<td>1.8</td>
<td>3.6</td>
</tr>
<tr>
<td>13. Survey of Languages</td>
<td>8.9</td>
<td>7.1</td>
<td>16.1</td>
</tr>
<tr>
<td>14. Programming Applications</td>
<td>23.2</td>
<td>5.4</td>
<td>28.6</td>
</tr>
<tr>
<td>15. Advanced Programming</td>
<td>5.4</td>
<td>1.8</td>
<td>7.1</td>
</tr>
<tr>
<td>II. Foundations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Data Structures</td>
<td>19.6</td>
<td>5.4</td>
<td>25.0</td>
</tr>
<tr>
<td>2. Numerical Analysis</td>
<td>1.8</td>
<td>1.8</td>
<td>3.6</td>
</tr>
<tr>
<td>3. Discrete Structures</td>
<td>5.4</td>
<td></td>
<td>5.4</td>
</tr>
<tr>
<td>4. Information Theory</td>
<td>1.8</td>
<td></td>
<td>1.8</td>
</tr>
<tr>
<td>5. Automata Theory</td>
<td>1.8</td>
<td></td>
<td>1.8</td>
</tr>
<tr>
<td>6. Symbolic Logic</td>
<td>1.8</td>
<td></td>
<td>1.8</td>
</tr>
<tr>
<td>7. Analysis of Algorithms</td>
<td>7.1</td>
<td></td>
<td>7.1</td>
</tr>
<tr>
<td>8. Formal Languages</td>
<td>3.6</td>
<td></td>
<td>3.6</td>
</tr>
<tr>
<td>9. Systems Theory</td>
<td>1.8</td>
<td>1.8</td>
<td>3.6</td>
</tr>
<tr>
<td>III. Hardware and Operations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Computer Organization</td>
<td>5.4</td>
<td>3.6</td>
<td>8.9</td>
</tr>
<tr>
<td>2. Hardware Systems</td>
<td>3.6</td>
<td>3.6</td>
<td>7.1</td>
</tr>
<tr>
<td>3. I/O Devices</td>
<td>1.8</td>
<td></td>
<td>1.8</td>
</tr>
<tr>
<td>4. Systems Programming</td>
<td>12.5</td>
<td>1.8</td>
<td>14.3</td>
</tr>
<tr>
<td>5. Compilers</td>
<td>1.8</td>
<td></td>
<td>1.8</td>
</tr>
<tr>
<td>6. Operating Systems I</td>
<td>8.9</td>
<td>3.6</td>
<td>12.5</td>
</tr>
<tr>
<td>7. Operating Systems II</td>
<td>3.6</td>
<td>3.6</td>
<td>7.1</td>
</tr>
<tr>
<td>8. Real Time Systems</td>
<td>5.4</td>
<td>3.6</td>
<td>7.1</td>
</tr>
<tr>
<td>9. Selection of Hardware Systems</td>
<td>3.6</td>
<td></td>
<td>3.6</td>
</tr>
<tr>
<td>10. Use of Software Packages</td>
<td>1.8</td>
<td></td>
<td>1.8</td>
</tr>
<tr>
<td>11. Analogs</td>
<td>1.8</td>
<td></td>
<td>1.8</td>
</tr>
<tr>
<td>12. Minicomputers</td>
<td>1.8</td>
<td></td>
<td>1.8</td>
</tr>
<tr>
<td>13. Management of Data Processing Systems</td>
<td>8.9</td>
<td>1.8</td>
<td>10.7</td>
</tr>
<tr>
<td>14. Person/Machine Interaction</td>
<td>1.8</td>
<td></td>
<td>1.8</td>
</tr>
<tr>
<td>15. Security</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV. Information Systems</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Information Systems I</td>
<td>17.9</td>
<td>1.8</td>
<td>19.6</td>
</tr>
<tr>
<td>2. Information Systems II</td>
<td>3.6</td>
<td></td>
<td>3.6</td>
</tr>
<tr>
<td>3. Accounting Systems</td>
<td>5.4</td>
<td>1.8</td>
<td>7.1</td>
</tr>
<tr>
<td>4. Management Information Systems</td>
<td>21.4</td>
<td>3.6</td>
<td>25.0</td>
</tr>
<tr>
<td>5. Systems Analysis</td>
<td>46.4</td>
<td>5.4</td>
<td>51.8</td>
</tr>
<tr>
<td>6. Systems Design</td>
<td>41.1</td>
<td>1.8</td>
<td>42.9</td>
</tr>
<tr>
<td>7. Files and Data Management</td>
<td>16.1</td>
<td>3.6</td>
<td>19.6</td>
</tr>
<tr>
<td>8. Information Retrieval</td>
<td>7.1</td>
<td>1.8</td>
<td>8.9</td>
</tr>
<tr>
<td>9. Database Management Systems</td>
<td>8.9</td>
<td>1.8</td>
<td>10.7</td>
</tr>
<tr>
<td>10. Case Studies</td>
<td>1.8</td>
<td></td>
<td>1.8</td>
</tr>
<tr>
<td>V. Probability and Statistics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Probability</td>
<td>14.3</td>
<td>1.8</td>
<td>16.1</td>
</tr>
<tr>
<td>2. Statistics I</td>
<td>28.6</td>
<td>3.6</td>
<td>32.1</td>
</tr>
<tr>
<td>Name</td>
<td>% Requiring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Introduction to Computers</td>
<td>85.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COBOL I</td>
<td>51.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systems Analysis</td>
<td>46.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systems Design</td>
<td>41.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FORTRAN I</td>
<td>37.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assembly I</td>
<td>30.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Statistics I</td>
<td>26.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Programming Applications</td>
<td>23.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management Information Systems</td>
<td>21.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simulation</td>
<td>21.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Structures</td>
<td>19.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information Systems I</td>
<td>17.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Files and Data Management</td>
<td>16.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Probability</td>
<td>14.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Statistics II</td>
<td>14.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systems Programming</td>
<td>12.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COBOL II</td>
<td>10.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decision Theory</td>
<td>10.7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

APPENDIX III—SOME SAMPLE PROGRAMS

I. Required:
- Introduction to Computers
- FORTRAN I and II
- COBOL I and II
- Assembly I
- Data Structures
- Analysis of Algorithms
- Management Information Systems
- Systems Analysis
- Systems Design
- Files and Data Management

II. Required:
- Introduction to Computers
- FORTRAN I
- COBOL I
- Assembly I
- Data Structures
- Management Information Systems
- Statistics I and II
Sampling
Regression
Decision Theory
Operations Research

III. Required:
Introduction to Computers
Survey of Languages
Programming Applications
Data Structures
Discrete Structures
Symbolic Logic
Computer Organization
Compilers
Probability
Statistics I and II
Forecasting

IV. Required:
Introduction to Computers
COBOL
Assembly
Data Structures
Discrete Structures
Information Theory
Automata Theory
Systems Programming
Information Retrieval

Natural Language Processing
Computer Assisted Instruction
Artificial Intelligence
Pattern Recognition

V. Required:
Introduction to Computers
FORTRAN
COBOL
Information Systems I and II
Files and Data Management
Statistics
Simulation
Deterministic Models
Stochastic Models

VI. Required:
Introduction to Computers
Data Structures
Analysis of Algorithms
Computer Organization
Minicomputers
Systems Analysis
Systems Design
Statistics I and II
Simulation
Deterministic Models
Stochastic Models

From the collection of the Computer History Museum (www.computerhistory.org)