THE UW-WHITEWATER MANAGEMENT COMPUTER SYSTEMS PROGRAM

Jacob Gerlach[+] and Iza Goroff*
University of Wisconsin-Whitewater

Employers of students trained in computer science and data processing fall largely in three categories: manufacturers of computer equipment, software houses, and finally end users of the computers. Of these categories, most employment opportunities are in the third category, the end user.

For each employer there is a range of positions from systems programmer to applications programmer to business systems analyst. Figure 1 shows the organization chart of a medium sized systems and data processing area in a company that manufactures consumer products. Of the sixty five positions which would require a degree in computer science or data processing, in at most seven (perhaps only two) of these positions would the traditional computer science graduate be preferred (if the employer had a choice).

At the University of Wisconsin-Whitewater our program is aimed at the large number of positions where a business background is helpful. In addition to introductory programming we require three programming courses, two analysis and design courses, a course in hardware and software selection and a course including data base management. In addition, all students must have at least 15 hours of business courses including two accounting courses and a management course. Our graduates have the technical ability to be good programmers and/or systems analysts, and they have the business background so that they can talk to users in the users own language.

In developing the major the faculty consulted outside business computing managers and the ACM Information Systems Curriculum[1]. Many of the courses in the major are very close to those specified in the ACM curriculum.

 0-89791-036-2/81/0200/0171 $00.75

Before the Management Computer Systems Major

The prerequisite structure of the Management Computer Systems core curriculum is shown in Figure 2. Although students declare their major as early as they are admitted to the university, they do not usually take a computer course until the first semester of their sophomore year. At that point they select one of two courses:

- Introduction to Programming
- Data Processing

Introduction to Programming

This course covers the following topics:

- Integer and real variables
- Branching, loops, logical operators
- Library functions
- Arrays (single and multidimensional)
- Character manipulation
- Subprograms and subroutines
- Program documentation
- Files

The course uses both BASIC and FORTRAN languages and the students write approximately 10 programs: Texts: Mullish, H., A Basic Approach to BASIC, Wiley, 1976, and Kreitzberg, C., and Schneiderman, B., FORTRAN Programming, Harcourt Brace Jovanovich, 1975.

Data Processing

Data Processing is a course designed to fulfill the AACSB computer requirements. An abbreviated outline follows:

Introduction to Computers	1 week
BASIC Language	9 weeks
concepts of programming concepts of documentation string and numerical manipulation programming with files	
Batch Processing	1 week
Business Computer Systems	5 weeks
systems analysis systems design	
Computer Science topics	1 week

Students do eight programming assignments in addition to an application systems paper. The current text for the course is Mandell, S., Computers and Data Processing, West Publishing Co., 1979.

The Management Computer Systems Core Curriculum

The core curriculum has been designed so that a student can traverse it in four semesters. This is an important feature. Many of our students are transfer students, either from other universities or from 2 year colleges. In addition, another large number come from students changing majors. The ability to switch to the major is especially important. The courses follow below.

Concepts and Programming of MCS I

This is the first course in the major proper. PL/I is used as a vehicle for teaching the concepts of structured programming. Top down design with stepwise refinement are the techniques taught. Application topics include:

- report generation
- array processing
- data validation
- sequential disk file processing
- merging files
- character manipulation
- sorting

Students code ten business application programs during the semester. One major purpose of the course is to teach the student professional habits. The assignments are graded on form, internal documentation, and appropriate variable names. Incorrect programs are not accepted. Students are penalized heavily for late assignments. Additional topics in the course include:

- introduction to the computer in business
- history of computers

Texts used in this course are Shortt, J. and Wilson, T., Problem Solving and the Computer, Addison-Wesley, 1979, and Hughes J., PL/I Structured Programming, Wiley, 1979.

Concepts and Programming of MCS II

This course corresponds to the ACM course UC1. The student continues to learn programming concepts, but the emphasis is on the following topics:

- Modular programming — 2 weeks
- Disk Files — 5 weeks
  - ISAM
  - Direct Access
  - VSAM
- Data structures — 6 weeks
  - Queues
  - Stacks
  - Linked Lists
  - Binary Trees
- Sorts — 3 weeks
  - Merge sort
  - Heap sort
  - Quick sort
  - Tree sort
  - Sort utilities

The assignments the students do in this course are quite involved and often include writing user manuals and doing maintenance to existing programs. The student writes about five original programs generally including:

1. An elaborate program that uses stacks, queues and linked lists.
2. One of the efficient sorts.
3. One using the utility sort.
4. At least two programs using the different disk file structures.

All programs are written using structured programming techniques. The text for this course is Augenstein, M.J. and Tenenbaum, A.M., Data Structures and PL/I Programming, Prentice-Hall, 1979.

Concepts and Programming of MCS III

This course is designed to teach the syntax of the COBOL language and structured programming in COBOL.

- Basic COBOL features
- Data storage
- Table processing
- Subroutines
- Basic file input/output
- "report writer"

The student codes ten moderate to difficult programs during the semester. Programming assignments are designed to cover all of the COBOL concepts presented in this course. The text for this course is Abel, P., COBOL Programming, Reston, 1980.

Hardware and Software Selection:

This course is to prepare the student for the eventual choices she/he will be called to make in the business environment. The course includes the following topics:

- Processor Architectures and Hardware Systems Configurations
  - Processor architectures
  - Peripherals and their control
  - Channels and channel types
  - Mainframe enhancements
  - Programmable micrologic "Hard/Soft" concept
- Management Considerations
  - Types of Vendors
  - Reasons for buying a computer
  - Informal feasibility study
  - Considerations and Specifications

Students write a request for information. They prepare an informal feasibility study, and they do an analysis of a hardware configuration.

Advanced Data Management Systems

This course covers the following topics:

Data Base Handlers 8 weeks

- general theory
- types
- programming with DL/I

Telecommunications and On-line Programming 4 weeks

- theory
- programming with CICS

Computer Graphics 4 weeks

- graphic output
- graphic input
- programming plotters and graphic terminals

The student writes programs with DL/I and CICS because these are products used for administrative programming at UW-Whitewater and, therefore, available for academic use. Graphics are run on a graphics terminal and a plotter. Text used for this course: Kroenke, Data Base Processing, SRA, 1979.

Systems Analysis and Design Sequence

The Systems Analysis and Design courses form a one year sequence. The courses are project oriented with projects begun in the first semester finished in the second. Students group into teams, typically three to seven to a team, to work on real projects drawn from various areas in the university community who otherwise could not get their projects developed.

Systems Analysis and Design I

The two broad topics in this course are systems analysis and logical systems design. Interwoven with the theory of systems are the student projects which embody the stages of the systems life cycle through the systems proposal stage. The course outline is:

General systems theory 1 week

Introduction to systems 4 weeks

- principles of logical file design
- activity vs. function
- cases and examples

Systems life cycle 4 weeks

- cycle as a whole
- problem definition
- data collection
- system alternatives
- cost benefit analysis

Preliminary project presentations 2 weeks

Decision support systems 2 weeks

- models
- man machine interaction

Final project presentations 2 weeks

A book used in both this course and the one following is Biggs, C., and Atkins, W., Managing the Systems Development Process, Prentice-Hall, 1980, which provides a structure of the systems cycle and its associated documentation. The course still lacks a suitable book in logical systems design.

Systems Analysis and Design II

The major topics in this course are physical systems implementation. Each of the Projects' logical procedures (brought forward from the previous course) are developed into a structure of program modules.

The methodology used for physical design is that given in Yourdan, E., and Constantine, L., Structured Design, Prentice-Hall, 1979, which is a text of the course.

Physical Systems Design 9 weeks

- physical file design
- structuring programs with modules
- program testing

Computer Security 1 week

Implementation 6 weeks

- User training
- Operations documentation
- User documentation
- Systems documentation
- Sign off

Other Major Requirements

In addition to the core curriculum students are required to select two courses from the following:

- Simulation
- Operations Research
- Business Data Processing Management
- Assembly Programming
- Advanced Assembly
- Operating Systems
- MCS Cooperative Studies

All MCS students are required to take:

- Accounting - 2 courses
- Management Concepts
- At least 2 additional upper level business courses.

Depending on the curriculum chosen - BS degree in the College of Letters and Sciences or the BBA degree in the College of Business and Economics there are additional requirements.

Conclusion

We are maintaining continuous contact with the employers of our graduates. Their acceptance of our graduates has been uniformly enthusiastic.

We have chosen fifteen people from the data processing management of these employer companies and institutions who sit on the MCS Executive Advisory Board which provides guidance to our faculty in the further evaluation of the MCS major at Whitewater.

Other people who have contributed to the design of the major include: M. Engert, R. Wysocki, E. Klein, P. Miller, P. Haine, J. Mescall, and A. Svanoe. We have benefitted from the support of R. E. Jacobson, C. Flanagan, L. Davis, Dean J. Domitrz and Dean E. Fulton.

+ Jacob Gerlach
Mathematics Department
UW-Whitewater
Whitewater, WI 53190

* Iza Goroff
Management Department
UW-Whitewater
Whitewater, WI 53190

1. Couger, J. D. Curriculum Recommendations for Undergraduate Programs in Information Systems, Communications of the ACM, Vol. 15, No. 12.

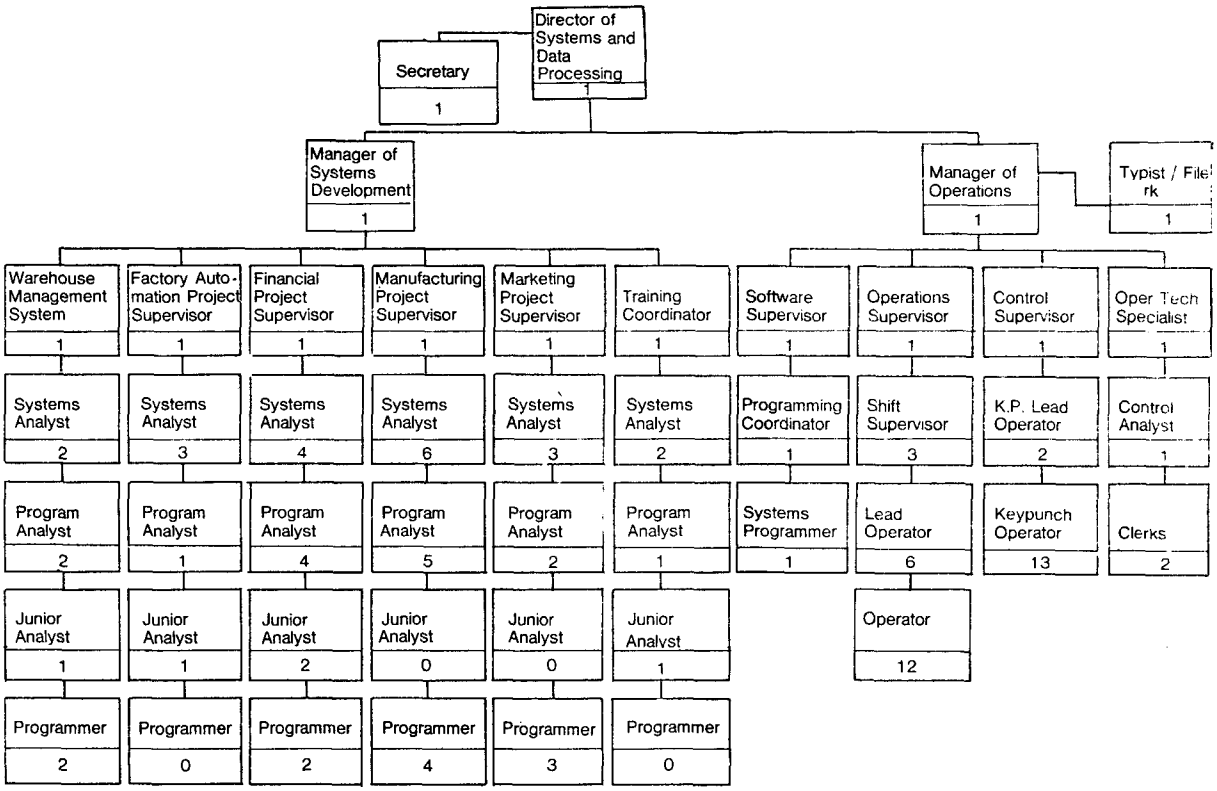

Figure 1 The organization of a typical business data processing department.

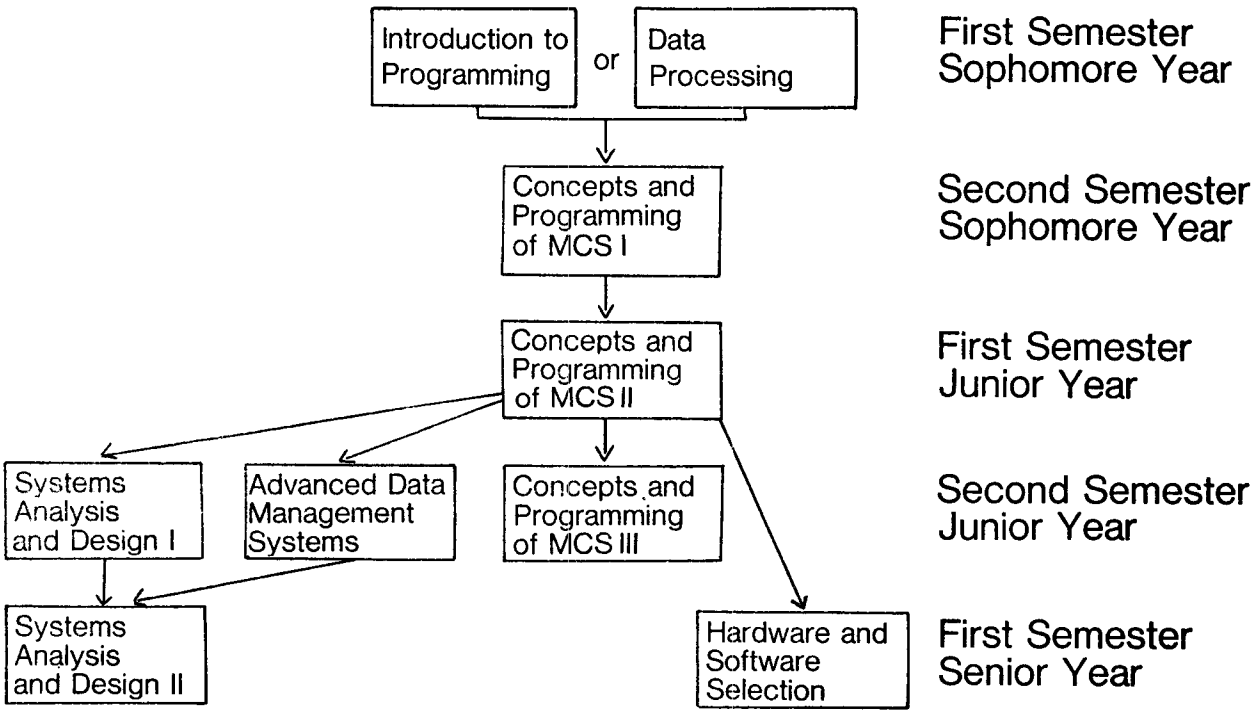

Figure 2 The prerequisite structure for the Management Computer Systems Major at the University of Wisconsin-Whitewater.