

**A ROBUST COURSE ON
DATA BASE MANAGEMENT SYSTEMS FOR
BUSINESS AND COMPUTER MAJORS**

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Introduction

This article describes the origin and evolution of a Data Base Management System course offered at a major university in response to industrial and academic demands. This course meets the needs of both groups in that it combines the academically oriented conceptualizations of D.B.M.S. and provides rigorous grounding through applied application for industry concerns. The audience intended for this course is diverse since the population drawn from is a major metropolitan area with a wide variety of part-time and full-time adult students. Further, since the course is offered in a School of Business Administration it must speak to both technical and managerial issues. As well, enough of the teaching methodology is revealed to allow other institutions to adopt the same or similar curriculum. Finally, the actual experiences of an instructor and his students is given to indicate some additional pros and cons.

Background

In 1960 the Donahoe Higher Education Act in the state of California brought together a series of individual State Colleges to form a system that is known today as the California State University and Colleges (C.S.U.C.) system. There are 19 campuses in C.S.U.C. offering bachelor's and master's degree programs in some 200 subject areas. Many of these programs are established so that a student can complete the appropriate requirements by part-time late afternoon and evening study. In addition many off-campus degree, certificate, and credential programs are available to meet the needs of non-traditional student desires.

One campus in this system is located in the City of Long Beach and serves the Los Angeles and Orange County metropolitan areas. This institution was founded in 1949 and is called California State University, Long Beach (C.S.U.L.B.). It is one of the largest in state enrollment with almost 33,000 students and a faculty

of more than 1,600. There are 67 degree programs at the baccalaureate level divided amongst the Schools of Applied Arts and Sciences, Social and Behavioral Sciences, and the Center for Public Policy and Administration.

The School of Business Administration is one of the largest in the state with an enrollment of approximately 6,000 students in various graduate or undergraduate pursuits. The academic programs are accredited by the American Assembly of Collegiate Schools of Business (A.A.C.S.B.) which is a highly regarded national accrediting agency. The physical site provides space for lecture and seminar instruction as well as laboratory areas for special activities. Among these labs is a data processing and information retrieval complex used by students to complete computer projects. The bulk of computer oriented classes offered in the School of Business Administration are contained in the Department of Quantitative Systems (one of several departments in the School).

The student population is diverse in background on social, economic, ethnic and age scales. The average age is around 26 with most students commuting to campus from all parts of Southern California. A majority are self-supporting and represent a wide range of employers from surrounding industries. A rapid growth in enrollment within the Quantitative Systems Department has occurred in the last few years with student interest centering on computer-related curriculum. An extensive review of these course offerings led to new tracks which systematically train students in particular fields by selected course work.

Courses

One phase of these tracks is a two semester Data Base Management Systems requirement. This requirement was developed as a result of an examination of academically accepted practices and industry concerns. The first semester provides fundamental concepts and project

exercises to the students in a 15 week, 3 hour-per week lecture format. The second semester is a separate course devoted to specialized and advanced topics in a 15 week, three hour format. In each case the courses provide 3 units of academic credit and require a number of prerequisite courses in the computer area. These classes are taken in the senior year and are numbered as upper division 480 and 481.

The first semester course, Q.S. 480, is of most interest since it provides an overall understanding of data base systems. This is accomplished by three main objectives:

1. Study of the fundamental concepts and terminology of D.B.M.S.'s.
2. Introduction to the basic techniques of data design at the conceptual level.
3. An exhaustive project using a D.B.M.S.

There are two distinct phases in which this is done. The initial phase of four weeks consists of an introduction to data base systems: what they are, what they can do, who needs them, etc. Concurrently, the student is learning how to use a data base query language, in this case, QUERY UPDATE, which is provided within the D.B.M.S. package. The student typically writes query language programs demonstrating the use of subprograms and the use of the report writing feature without any interface with the D.B.M.S.

In the second phase, beginning with the fifth week and continuing until the end of the semester at the fifteenth week, students form voluntary groups of three people each to be known as Project Teams or Data Base Programming Teams. One student is selected by each team to be that team's project leader. The project leader is responsible for coordinating the entire effort of that team. Three has evolved to be the ideal size for a project team; fewer than three places too much burden on too few individuals, and more than three leads to one individual concealing himself behind the efforts of others on the team.

The team selects an enterprise, real or hypothetical, and states a data management problem relevant to that enterprise. Formal specifications are drawn up between the instructor in the role of customer and the project team in the role of the software firm. When both parties have signed the mutually agreed specifications, this document becomes the binding contract on which the final performance is evaluated.

During this project phase there are classroom lectures on data base design techniques and the theory of data normalization. Each project team will attempt to apply the classroom material to the design of the individual team project. The understanding here is that all projects will be done using the query language, with other high level languages reserved for Q.S. 481.

In addition to the design of the data base, the project team is responsible for fully implementing the complete software package. This includes defining the data base relations, creation of the appropriate schemas, loading of representative test data, providing capability for inserting, deleting, and modifying data. Also, each specification will require the relational retrieval of data satisfying complex conditions and the writing of various reports using data extracted from several files via data base relations.

The project must be fully documented in every detail by means of a complete reference manual (RM) and user's guide (UG). The UG is aimed at the inexperienced novice who may have never used a computer system before now. This document, the UG, contains many clear examples demonstrating the full use of all of the features of the project software. The reader/user is led step by step through each feature. No technical material may be included. The RM is the technical document which will be used by a data base maintenance programmer for future modification of the package. Technical terminology is employed extensively and the source code of all software is thoroughly described.

Methods

A sample syllabus is given in Figure 1 to illustrate on a weekly basis the readings and projects to be done. Though one textbook is chosen as the main course text many others are referenced throughout the term. Computer manuals are used to allow the student to learn about doing actual hands-on projects. On the C.S.U.L.B. campus a Control Data Corporation (C.D.C.) CYBER 170/750 is used with the software set of C.D.C.S. (CYBER Database Control System) providing the needed query and D.D.L. architecture. A total of 310 points are possible for each student and are broken down as:

1. Two assignments at 20 points each.
2. Three tests at 40 points each.
3. One project with 50 points each for Programming, UG, and RM.

Other items used are:

a. An evaluation criteria sheet which lists categories and considerations. This includes external documentation issues, program style, output formatting, design, elegance, etc.

b. A teacher/class evaluation form to gain feedback from the students. This includes teacher criteria (knowledge, relationships, presentation) and class criteria (course pace, segmentation, weaknesses, strengths).

Comments

After the course was initially offered student demand greatly increased. Student reaction on the evaluation forms have indicated that this course has filled a valuable "gap" for them. The perceived gap is either a lack of conceptual or applied background on D.B.M.S. which is balanced in the new course. Many of the

students that work as professional programmers complimented the course structure for its realism and intense nature. The instructors have enjoyed teaching the course though they are often caught by some surprise in the packages available (i.e., hidden features). As well, at times students crave applied issues over conceptual ones so that they can get on with the tasks assigned.

Conclusion

This article has described the origin and evolution of a D.B.M.S. course that serves a general audience and could be adopted by other universities. Experiences indicate that the curriculum is successful but only through the proper planning and preparation done in advance. Further, industry should be aware of what universities are doing to teach and train it's graduates.

FIGURE 1 - SAMPLE SYLLABUS Q.S. 480 SYLLABUS

Textbook: Chris J. Date, An Introduction to Database Systems, Third Edition, Addison Wesley, 1981.

Approximate Class Schedule:

Week	Textbook/Lecture	Applications and Project
1	Ch 1	QU, Assignment 1
2	Ch 2: pp. 33-44	(Assignment 1 due)
3	Ch 3: pp. 63-67	QU and report writing
4	Ch 4	Project requirements (Assignment 2)
5	Ch 4	Team formation; specifications
6	Ch 14	Writing Project design
7	Ch 14	Subschema creation
8	Ch 14	QU in CRM access mode
9	Ch 12	"
10	Ch 12	"
11	Ch 13: overview	"
12	Ch 5-6: overview	"
13	Ch 7-8: overview	Documentation requirements
14	Ch 9-10: overview	"
15	Conclusion	Project due

The textbook topics by chapter are:

Ch 1: Introduction to basic database concepts
 Ch 2: Data storage structures
 Ch 3: Introduction to relational databases
 Ch 4: More relational databases
 Ch 5: Architecture of SYSTEM R
 Ch 6: Data structures of SYSTEM R
 Ch 7: SYSTEM R data manipulation
 Ch 8: Embedded SQL
 Ch 9: The external level of SYSTEM R
 Ch 10: The internal level of SYSTEM R
 Ch 12: The relational algebra
 Ch 13: The relational calculus
 Ch 14: Data normalization