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Introduction

The release of Version 5 of the SAS® System with new software products, the development of the SAS System under PC DOS, and the acquisition of the SYSTEM 2000® Data Base Management System produced a greater demand for training to support our software products. The Education Division at SAS Institute is striving to meet that demand by updating existing courses, expanding our training curriculum and our training facilities. We have just added a series of computer-based training (CBT) courses to our curriculum to supplement the video- and instructor-based courses already offered. These three training methodologies provide a variety of training avenues for SAS software and SYSTEM 2000 DBMS users.

Currently, we have thirty-one instructor-based courses to support our software with several more courses under development. Three of the courses support the SAS System on personal computers, five courses support SYSTEM 2000 DBMS, and the remaining courses support Version 5 of the SAS System for mainframes and minicomputers.

In video-based training, we have seven courses with one under development. Three of the courses are new and were developed to support SAS users in the information center.

During the past year we started distributing our first CBT course to support Version 5 of the SAS System for mainframes and minicomputers. At this time, we have five CBT courses that support SAS software. The four new courses are available for mainframes only. We have started the development of a library of CBT courses to support the SAS System on personal computers.

New Training Facilities

Our instructor-based courses are offered as public courses and on-site courses. In past years, public courses were supplemented with computer workshops only at the SAS Institute Training Center in Cary, North Carolina. In response to greater demand for training with computer workshops, SAS Institute in the past year has opened three new training facilities. In June a new training center was opened in Cary. The new facility has three computer laboratories including both terminals and personal computers for workshops, in a large auditorium, and two classrooms. The new facility is capable of serving 160 students in four concurrent classes.

With the acquisition of SYSTEM 2000 Data Base Management System, SAS Institute established a smaller training center in Austin, Texas. During 1985 only SYSTEM 2000 DBMS courses were offered at the Austin facility. In November the training center in Austin was expanded to accommodate more classes. The new facility has two classrooms, a computer laboratory with twelve full-screen terminals, and a dining area. This allows the Institute to teach SAS software courses in addition to the SYSTEM 2000 DBMS courses already offered. In 1986 almost all of the instructor-based courses in the SAS and SYSTEM 2000 DBMS curriculums are being offered at the Institute's training center in Austin.

In addition to the two training centers, SAS Institute has established a new training site in cooperation with ORI, Inc. located at ORI headquarters in Rockville, Maryland. The site offers instructor-based training with computer workshops for SAS and SYSTEM 2000 users in the greater Washington, DC area. There are more than 500 SAS software and 80 SYSTEM 2000 installations in the Washington, DC area. This new training site enables these users to receive hands-on training at a convenient location.

Instructor-Based Training Courses

For 1986, we have a total of thirty-one instructor-based courses in our training curriculum. In the past year we added thirteen SAS training courses and five SYSTEM 2000 courses. Ten of the SAS training courses are for mainframe and minicomputer users:

- SAS® Display Manager
- SAS/AF® Software for Applications Programmers
- Spreadsheet Analysis with the FSCALC Procedure
- Applications Programming Using the SAS® System
- Introduction to Statistics Using the SAS® System
- Basic Statistical Quality Control
- Analysis of Research Data: Practical Applications
- Automatic Forecasting for Decision Support
- Experimental Design and Decision Support
The SAS® Display Manager course is designed for users who plan to run interactive SAS sessions using the SAS Display Manager System. This course explains how to use the new full-screen facility to interact with all parts of a SAS job. It begins with an overview of display manager capabilities and of the three display manager screens: the program editor screen, the SAS log screen, and the procedure output screen. It continues with how to use the system to edit program and data files, submit SAS jobs, save program files, and print SAS log and procedure output screens. Typically, this course will be used as an add-on to other instructor-based courses and can vary in length from one to three hours depending on the number of display manager features that the user wants to learn. Hands-on workshops are available upon request.

The SAS/AF® Software for Applications Programmers course is for experienced SAS software users who want to develop easy-to-use, menu-based systems with SAS/AF software. The course explains how to use the software to build user-friendly front-ends for data processing applications. It covers how to create, edit, and store screens, define screen layout, and display the screens. Computer workshops are included in the course to reinforce the lecture material.

The Spreadsheet Analysis with the FSCALC Procedure course is for experienced SAS software users who want to use SAS/FSP® software's FSCALC procedure to produce spreadsheets for business and research. The course explains how to generate spreadsheets from SAS data sets, create and update SAS data sets from FSCALC spreadsheets, transfer information from spreadsheet to spreadsheet, and consolidate information from several spreadsheets into one. It also covers how to generate printed reports from spreadsheets or selected portions of spreadsheets.

The Applications Programming Using the SAS® System course is designed for experienced users who write SAS programs on a regular basis and want to make extensive use of the SAS System. It covers how to use the SAS System more effectively as a programming language and how to design and implement efficient and easily maintained systems and programs. Discussions survey and evaluate the effectiveness, efficiency, and maintainability of available techniques for solving common problems and implementing standard functions. The course was developed jointly by ORI, Inc. and SAS Institute.

The Introduction to Statistics Using the SAS® System course is designed for users who want to review introductory statistical concepts and relate these concepts to relevant SAS procedures. The course covers data summarization, hypothesis testing, statistical significance, and confidence levels. SAS procedures for performing analysis of variance and regression analysis are introduced.

The Basic Statistical Quality Control course is designed for managers, information supervisors, process engineers, quality analysts, inspectors, and others who want to apply SAS/QC® software to commonly-used statistical quality control problems. The course explains how to use SAS/QC software to construct Shewhart control charts, cumulative sum control charts, and perform capability analysis. It includes a brief overview of statistics, and special topics, such as tests for special causes, historical control charts, and control charts for individual measurements and moving ranges. Computer workshops are available upon request and high-resolution graphics output.

The Analysis of Research Data: Practical Applications course is for users who want to use SAS software to develop regression models and analyze data from experimental designs. This course teaches how to analyze industrial, governmental, and academic research data using ready-to-use procedures within the SAS System. It covers several SAS procedures including their limitations and underlying assumptions, and how to interpret their output.

The Automatic Forecasting for Decision Support course is for business, economic, and capacity planners, inventory managers, engineers, management scientists, and market researchers. The course covers practical applications of automatic forecasting techniques in SAS/ETS® software. Students learn which SAS procedures are available for their applications and how to interpret the output. They also learn the limitations and inferences that can be drawn from each statistical procedure.

The Experimental Design and Analysis course is for researchers in the physical, biological, and engineering sciences interested in efficient planning of experiments. The course focuses on up-to-date methods for experimental design. Students learn how to handle a relatively large number of factors at minimal cost. Attention is placed on data analysis and designs to determine optimum conditions for conducting their experiments. The SAS System's GLM, REG, and RSREG statistical procedures are used to analyze the designs presented.

The Applied Multivariate Analysis: Concepts and Applications course is for researchers and data analysts who measure more than one response variable on each individual, object, or experimental unit. The course covers applied multivariate analysis techniques including: principal component analysis, canonical correlation analysis, discriminant analysis, cluster analysis, multidimensional scaling, and graphic display of results. The techniques
discussed are of special interest to marketing researchers, and those involved in the social and biological sciences.

Three of the SAS training courses were developed to support SAS System on personal computers:
- Applying Your SAS® Software Skills on Personal Computers
- SAS® Basics for Personal Computers
- Introduction to Statistics Using SAS/STAT™ Software.

The Applying Your SAS® Software Skills on Personal Computers course is the first in a series of SAS training courses planned for PC users. This course is designed for experienced SAS users who want to use SAS software on personal computers. It covers pertinent PC DOS commands, the window concept in the PC SAS System, interfaces with non-SAS PC file structures, and uploading and downloading information from a mainframe or minicomputer system.

The SAS® Basics for Personal Computers course is designed for PC users who have little or no experience with SAS software. The course covers the basic concepts of a typical SAS job and how the software reads and processes data to build a SAS data set. Additional topics include data management, data retrieval and summarization, printer graphics, and SAS windows.

The Introduction to Statistics Using SAS/STAT™ Software course is for those who want to review introductory statistical concepts and methods. The course covers simple graphical techniques for presenting data and data summarization. Sample means and standard deviations are used to draw inferences about appropriate populations. Also discussed are concepts of hypothesis testing, statistical significance, and confidence levels. The course introduces more advance techniques including analysis of variance and regression.

During the past year, five SYSTEM 2000 DBMS training courses were added to our training curriculum:
- SYSTEM 2000% Technical Fundamentals
- SYSTEM 2000% Applications Programming
- SYSTEM 2000% Data Base Design & Implementation
- SYSTEM 2000% DBMS for Nonprogrammers
- SYSTEM 2000% Report Writing with Genius.

The SYSTEM 2000% Technical Fundamentals course is for data base administrators, scientists, engineers, and programmers who want to use SYSTEM 2000 DBMS for data retrieval and updates. The course stresses the fundamental concepts of data base file structures and internal processing. Emphasis is placed on how to read a schema (the data base definition) and how it relates to the data trees (stored data values). The course focuses on the ACCESS language for data retrieval and updates and illustrates efficient processing techniques.

The SYSTEM 2000% Applications Programming course is designed for applications programmers and other technical users of SYSTEM 2000 data bases. The course assumes prior knowledge at the level taught in the Technical Fundamentals course. It provides an overview of the full function capabilities of the SYSTEM 2000 DBMS programming language extension (PLEX) facility. PLEX statements are used in COBOL, FORTRAN, and PL/I programs to retrieve and update information.

The SYSTEM 2000% Data Base Design & Implementation course is for data base administrators, systems programmers, applications programmers who design and administer large production data bases. The course illustrates how to use built-in SYSTEM 2000 DBMS facilities to design and implement data bases. Topics covered include data base security, the data base environment, recovery techniques, monitoring and controlling the data base, and problem investigation and resolution.

The SYSTEM 2000% DBMS for Nonprogrammers course is designed for end-users who want to store, retrieve, and update information in a SYSTEM 2000 data base. It explains how to interpret and use a SYSTEM 2000 data base definition to construct commands for interactive retrieval of data.

The SYSTEM 2000% Report Writing with Genius course is designed for users who want to produce reports from information in SYSTEM 2000 data bases. This course covers the full range of reporting capabilities available in the SYSTEM 2000 Data Base Management System. The first two days focus on how to develop the appropriate code to produce desired reports. The final day places emphasis on using Genius to help produce desired reports.

Video-Based Training Courses

Several video-based SAS training courses have been added to the curriculum during the past few months. We have just completed a three-course series for beginning end-users. This series was designed to support Version 5 of the SAS System in an information center environment. Together, these courses teach end-users with very little
Users learn to read raw data files and to produce reports ranging from simple listings to tabular reports containing summarized data to graphic reports. The courses in this series are:

- Introduction to the SAS® System: Your First SAS Job
- Introduction to the SAS® System: Building Your Basic Skills
- Producing Effective Graphics with SAS/GRAPH® Software

The first course, Introduction to the SAS® System: Your First SAS Job, is designed for end-users with limited computer experience who want to analyze data and produce reports using the SAS System. The course explains the fundamental concepts of a SAS job and shows how to use SAS statements to read and process data. The course also introduces the SAS Display Manager System and illustrates how to use it to execute simple SAS jobs.

The second course, Introduction to the SAS® System: Building Your Basic Skills, is a new course. It is for beginning SAS software users who want to expand their fundamental skills by learning new ways to work with SAS data sets and produce reports. The course teaches how to read various types of raw data files, create and modify variables, work with SAS data sets, and produce and enhance the appearance of reports.

The third course, Producing Effective Graphics with SAS/GRAPH® Software, is also a new course. It is for end-users with minimal SAS software skills who want to display data graphically. The course explains how to use SAS/GRAPH software to transform data into interesting and effective graphics. A wide range of fundamental SAS/GRAPH capabilities are presented such as creating slides, plots, and charts.

The computer-based training courses as of 1984 included:

- Expanding Your Base SAS® Software Skills
- Report Writing with Base SAS® Software
- Using the SAS® Display Manager System
- Data Entry, Retrieval, and Business Writing.

For advanced users, we offer:

- Expanding Your Base SAS© Software Skills
- Report Writing with Base SAS® Software
- Using the SAS® Display Manager System
- Data Entry, Retrieval, and Business Writing.

The courses are designed for end-users with minimal experience using SAS software. The course covers ways to create and manipulate SAS data sets using the SAS Display Manager System. Students learn additional techniques for reading data from external files, computing new data values, and controlling data in SAS data sets.

The fourth course, Expanding Your Base SAS® Software Skills, is designed for end-users with minimal experience using SAS software. It is for beginning SAS software users who want to produce business reports in the form of lists, tables, and charts. The course covers how to use base SAS software to list and summarize data in tables and bar charts. It defines the components of typical business reports and explains how to get data into the desired form for reporting.

The third course, Using the SAS® Display Manager System, explains how to use the SAS Display Manager System to interact with all parts of your SAS job, including SAS statements, the SAS log, and procedure output. It begins with a discussion of using display manager command-line commands and function keys to accomplish daily tasks. Next, line commands are introduced to simplify your editing needs. Finally, some advanced features for customizing a display manager session are presented.

The fourth course, Data Entry, Retrieval, and Business Writing, teaches students to use the following SAS/FSP procedures: FSEDIT for editing and updating SAS data sets, FSBROWSE for retrieving information, and FSLETTER for creating and sending letters. The branching capabilities in this course make it suitable for beginning and experienced SAS software users. Beginning users can choose an instructional path that explains how to enter and edit data on preformatted screens and forms. Applications developers learn how to create and modify SAS data sets and FSEDIT screens, and how to define standardized forms for business correspondence.
Conclusion

Although the courses in the three training options (computer-based, video-based, and instructor-based) were introduced separately, they all are part of the SAS training curriculum. The courses are designed in such a way that a user can go from introductory to advanced courses by selecting courses from each option or by taking several courses from a single training medium. Additionally, some students find it advantageous to supplement one form of training with another. For example, a CBT course could be taken prior to attending a comparable instructor-based course to provide the student with a good foundation for questions pertaining to his/her specific applications. Another effective training strategy is to simultaneously take a video-based course and a CBT course. Topics covered in the video lecture would be reinforced through topics and exercises presented in the CBT course. Other training strategies can be developed based on the student's needs and desired pace of learning.

The Education Division at SAS Institute is constantly improving and expanding its training curriculum in hopes to provide SAS software SYSTEM 2000 DBMS users with the best available training.

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