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AN EIGHT WEEK SUMMER INSTITUTE TRAINING PROGRAM TO TRAIN INSTRUCTORS OF INSTRUMENTATION TECHNOLOGY.

BY- MCKEE, DELBERT A.
STATE UNIV. OF N.Y., MORRISVILLE,AG.AND TECH.COLL.

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A SUMMER INSTITUTE IN INSTRUMENTATION TECHNOLOGY WAS HELD TO PROVIDE TEACHERS WITH CURRENT KNOWLEDGE ON AUTOMATIC, PROCESS-CONTROL INSTRUMENTATION. A PREVIOUSLY DEVELOPED GUIDE FOR A 2-YEAR, POST-HIGH SCHOOL CURRICULUM PROVIDED THE BASIS FOR INSTRUCTION AND DISCUSSION DURING THE INSTITUTE. THREE COURSES IN MEASUREMENT AND INSTRUMENT SHOP PRACTICES, CIRCUITS AND ELECTRICAL PHYSICS, AND MATHEMATICS AND MECHANICAL PHYSICS WERE TAUGHT. THE COURSE WORK CONSISTED OF LECTURE, RECITATION, AND LABORATORY SESSIONS. SIX SPECIALISTS CONDUCTED SPECIAL SEMINARS, AND FOUR FIELD TRIPS WERE UNDERTAKEN. IN SPITE OF THE VARIED BACKGROUNDS OF THE 11 PARTICIPANTS AND SOME PROBLEMS OF SCHEDULING, MOST FELT THAT THE PROGRAM WAS QUITE SUCCESSFUL. (GD)

FINAL REPORT
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November 23, 1966

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

Office of Education
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Delbert A. McKee

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State University of New York
Agricultural and Technical College at Morrisville

Morrisville, New York

# INTRODUCTION

For the past fifteen to twenty-five years, the use of automatic process control instrumentation has grown tremendously. This rapid growth has created a great shortage of well trained technicians for the design, installation, and maintenance of automatic process control systems.

To help alleviate this shortage of trained manpower, the United States Office of Education contracted with the Instrument Society of America to produce a curriculum guide for post-high school education in Instrumentation Technology. Austin Fribance, Professor in the Mechanical Department of Rochester Institute of Technology, is the author of the guide. This guide, OE - 80033, entitled "Instrumentation Technology", is a suggested two-year, post-high school curriculum for training such technicians.

A pilot program supported by the U. S. Office of Education for preparing teachers to teach the information covered in the guide was conducted at Rochester Institute of Technology in the summer of 1965, with Austin Fribance as director of the program. Information was extremely late in reaching prospective participants for this program, and as a result, only a few teachers took part in it.

The program at R. I. T. showed that the material covered by the guide could be best implemented by expanding the teacher preparation to a two-summer program.

In line with this thinking, the U. S. Office of Education funded two programs to prepare teachers to teach subjects covered for the first two semesters of Instrumentation Technology during the summer of 1966. One of these programs was conducted at State University of New York, Agricultural and Technical College at Morrisville, New York, and the other at Pasadena City College, Pasadena, California. This report deals with the Morrisville program.

## METHOD

The State University of New York, Agricultural and Technical College at Morrisville, New York; with the assistance of Dr. Karl B. Schnelle, Jr., Manager of Education and Research, Instrument Society of America, submitted a proposal to the United States Office of Education in February 1966, outlining a program to be conducted at Morrisville in the summer of 1966 to prepare teachers to teach the first year courses as outlined in the curriculum guide # OE - 80033.

The Office of Education funded the program and negotiated a contract with the College at Morrisville in late April 1966.

Brochures were prepared and mailed to prospective participants in May 1966. The brochure gave the starting date as July 5, 1966, and the ending date as August 26, 1966, and asked that applications be mailed to Professor Delbert A. McKee, Director of the program, by June 15, 1966.

Applications were received from fifteen teachers. Invitations to attend the program were extended to all, but only eleven participants accepted the invitations. The program was started on July 5, 1966, as scheduled, and was completed on August 26, 1966.

The program at Morrisville was conducted by distributing the teaching load among three professors, Delbert A. McKee, Associate Professor in Industrial Instrumentation Technology at Morrisville, directed the program, and taught the courses in measurement and instrument shop practices. Eugene Larchar, Associate Professor in Electrical Technology at Morrisville taught the courses in AC - DC circuits and electrical physics. James McFarland, Associate Professor in Engineering Science at Morrisville, taught the courses in mathematics and mechanical physics.

During the summer, six specialists conducted seminars. Professor Austin Fribance lead the discussion on July 8, 1965, in resistance-capacitance effects on control systems. Representatives of the Solvay Process Division, Allied Chemical Corporation, lead the discussion on instrument shop operation, on July 13, 1966. The representatives were Mr. Thomas Brogan and Mr. R. Tracey.

On July 20, 1966, Mr. William Fenninger, Executive Secretary, American Technical Education Association, conducted a seminar in Vocational - Technical Education. Mr. Henry Stoll, Taylor Instrument Company, led the discussion on flow measurement, on August 3, 1966. Dr. Karl B. Schnelle, Instrument Society of America, led the discussion on the mathematics required for instrumentation technicians, on August 9, 1966. Professor Frank B. Moore, Pennsylvania State University, led the discussion on radiation measurement, on August 17, 1966.

Four field trips were taken during the summer. On July 14, 1966, the class went to the Solvay Process Division, Allied Chemical Corporation, Syracuse, New York, to observe the operation of some control systems and to see the instrument maintenance problems involved. On July 26, 1966, the class visited the Instrumentation Work Shop at Hobart College, Geneva, New York, to see some special teaching devices. On July 27, 1966, the Corning Glass Company, Corning, New York, hosted the class and showed the specific problems and methods of instrumentation in their plant. On August 16, 1966, the class visited International Business Machines Corporation, Endicott, New York, to see the special applications of instrumentation required by I. B. M.

The course work at Morrisville consisted of lecture, recitation, and laboratory sessions. Monday, Wednesday and Friday forenoons were devoted to instrumentation courses, Tuesday and Thursday forenoons to mathematics, Monday and Wednesday afternoons to physics, and Tuesday and Thursday afternoons to AC - DC circuits. The electrical and electronics laboratories were used in support of the theory work in AC - DC circuits and electrical physics. The physics laboratory was utilized in support of the theory work in mechanical physics. The instrumentation laboratory was used in support of the theory work in the instrumentation courses.

The equipment utilized in the instrumentation laboratory consisted of panel-mounted commercial equipment and some special teaching devices as engineered by Brodhead - Garrett Corporation, and Hickock Teaching Systems, Incorporated.

## RESULTS

The participants in the Morrisville program were very heterogeneous in backgrounds. Most of them were well-grounded in electricity and electronics and felt that too much time was spent in that area for them. Others were not well-grounded in this area and could have utilized more instruction in electric circuits.

A few were well up on their mathematics, but most needed more time in this area and not as much information as outlined in the guide could be covered.

In the area of physics, the group was about evenly divided in having fair background and very sparce background. Again, too much time was felt spent by some, and not enough by others.

Only one participant had much background in the area of instrumentation, and most had none. In this area, all felt too little time was spent. While it was possible to cover the material as outlined in the guide, it was extremely concentrated and accelerated.

All the participants felt that their backgrounds in all the areas had been strengthened, and that they had received a substantial amount of information which they could use upon returning to their respective schools.

Over all, the program appears to have been quite successful, even though the time schedule in each area needs some modification.

## DISCUSSION

The Summer Institute in Instrumentation Technology offered at Morrisville during the summer of 1966 was felt to be a success, since all the participants gained substantially in background.

It is regrettable that only eleven participants took part. If information concerning the program could have been in the hands of prospective participants at a substantially earlier date, more might have taken part. Many of those contacted had already made prior commitments. Inquiries have been received from others during the summer who apparently were not reached by the information put out this year.

The results obtained with the program this year indicate a definite need on the part of the participants involved to take part in the second-year studies. They also indicate that there may be a need to run the first-year program again for those not already reached. It is also very apparent that a different time schedule than was used this summer is needed so that more time can be spent on the outlined instrument courses.

It also seems advisable to bring some of the second-year course content in the instrumentation courses forward to the first year, and to extend some of the first-year content in supporting courses into the second year. It may even be expedient for the sake of good educational practice to combine some of the separate instrumentation course listings with other listed instrumentation courses.

The participants in the program indicated that they would have preferred fewer field trips, and that the time spent on field trips might have been more profitably spent in the instrumentation laboratory. This should warrant some thought in developing future programs.

The consensus of opinion seemed to be that the transition from classroom theory to the commercial equipment mounted on the panel could be made without the aid of specially designed teaching system equipment, but that with properly engineered teaching system equipment, the transition could be made a little easier. There seems to be a need for both the commercial equipment and the specially designed teaching equipment.

The participants in the 1966 program have indicated that the support for dependents in such programs should be made equitable to the dependent support offered under National Science Foundation programs. The program at Morrisville this year furnished support for only one dependent, and the N. S. F. offerings furnish support for up to four.

There was a slight amount of confusion this year concerning college facilities which should be available to summer session students, and the library hours left a little to be desired. It is hoped that these small difficulties will be adequately eliminated by the summer of 1967.

## CONCLUSIONS AND RECOMMENDATIONS

Operating on the premise that the education of instrumentatio technicians is a necessity, and that the course content as outlined in the curriculum guide will give such technicians an adequate background upon which to build a successful career, and that there is a scarcity of teachers qualified to teach such courses, it can only be concluded that programs such as that conducted at Morrisville and Pasadena are also a necessity.

The program at Morrisville was successful in greatly developing the background of the participants, but the experience this summer also shows that some revisions in scheduling of time and sequencing of courses is needed.

It is recommended that the second year of the program should be presented in the summer of 1967, and that the first year should be presented to a new group.

In consideration of travel distances involved, it is recommended that one program should be run in the eastern half of the United States, and that one program should be run in the western half, as was done this year.

It is recommended that course work be scheduled exactly the same as it would be done during the regular semester. This would cut down on the length of lecture classes and increase the laboratory time available for the instrumentation laboratory.

It is recommended that proposals be forwarded to the Office of Education early this fall so that action can be taken on them by January 1967. This would allow information brochures to be sent out in February 1967 and all teachers needing such training might thus be reached in 1967 and 1968.

## SUMMARY

Technological advances in the past two decades have created a shortage of trained technicians to work with automatic process control equipment. Teachers are needed to train such technicians and in 1966, the U. S. Office of Education, in cooperation with the Instrument Society of America, organized and funded two summer institutes to help train prospective teachers. One of the institutes was conducted on the campus of the State University of New York, Agricultural and Technical College at Morrisville under the supervision of Associate Prof. Delbert A. McKee.

The general content of the courses at the institute was as suggested in the U. S. Office of Education curriculum guide for Instrumentation Technology OE-80033. The content for the first year as suggested in the guide was covered during the eight week institute, the idea being that the second year's content could be covered in a subsequent institute. The program consisted of 36 hours a week of classes and laboratories with time being taken for six industrial specialists to conduct seminars and three related industrial field trips. Three instructors handled the teaching load.

The results of the program were rather encouraging considering the varied background of the students. Most of the students had a significant lack of mathematical background, which hindered to some extent the study of Electricity and Physics on a collegiate level. A better selection of applicants would have been possible if the final approval for the program had been made at an earlier date than late April.

The participants felt satisfied with the program in general, with the exception of possible modifications in time scheduled for various subjects. Most students felt they were taking considerable knowledge back to their respective schools. The feeling was that the second year of summer institute would be much more meaningful in the field of hardware and actual control practice. There is some feeling that control and measurement should be taught simultaneously which is in disagreement with the curriculum guide.

Some improvement is needed in the usage of the college facilities and coordination between class hours

and library hours etc. It is felt that more funds allocated for textbooks, and dependency allowances compatible with the National Science Foundation grants be considered. In general, the program can be considered successful and a need for a second summer follow-up institute is definitely indicated.