AN EVALUATION OF THE ELECTROMECHANICAL TECHNOLOGY CURRICULUM AT OKLAHOMA STATE UNIVERSITY

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TABLE OF CONTENTS

Chapter		Page
I.	INTRODUCTION	1
	Statement of the Problem	2
	Purpose of the Study	3
	Need for the Study	4
	Scope of the Study	7
	Assumptions	9
	Definition of Terms	10
II.	REVIEW OF THE LITERATURE	14
	Current Curriculum Practices	14
	The OSU EMT Curriculum	23
	Characteristics of the Graduates	29
	Summary	30
III.	METHODOLOGY	33
	Determination of EMT Curriculum Practices	33
	Determination of OSU EMT Graduate Employability	37
	Overall Analysis	45
IV.	PRESENTATION AND ANALYSIS OF THE DATA	47
	Electromechanical Technology Curriculum Practices	47
	Comparison of OSU Curriculum Content to the National Averages	62
	OSU EMT Graduate Employability	66
	Comparison of OSU EMT Graduates and Industry Populations	68
V.	SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS	75
	Summary	75
	Conclusions	80
	Recommendations	84
A SELECTED BIBLIOGRAPHY		86

Chapter Page

APPENDIX A - SCHOOLS LISTED AS HAVING ELECTROMECHANICAL OFFERINGS 90

APPENDIX B - JUNIOR/COMMUNITY COLLEGES RANDOM SAMPLE 95

APPENDIX C - LETTER TO SELECTED SAMPLE OF TWO-YEAR COLLEGES . . . 99

APPENDIX D - TECHNICIAN TRAINING DIRECTORY INFORMATION FOR NEXT EDITION OF TECHNICAL EDUCATION YEARBOOK 100

APPENDIX E - OSU EMT CURRICULUM. 103

APPENDIX F - EMT CURRICULA CONTENT 104

LIST OF TABLES

Table Page

I. Comparison of 1967-68 and 1969-70 Listings of Schools with Electromechanical Courses or Curriculums 20

II. Applications of Unified Concepts (Resistance) 27

III. Extent of Electro-Mechanical Technology Curriculum Offerings in the United States 48

IV. Credit Hour Requirements of 33 Electro-Mechanical Technology Curriculums 52

V. Percentage of Total Credit Hours of 33 Electro-Mechanical Technology Curriculums 52

VI. Electromechanical Curriculum Survey Percentage of Credit Hours and Number of Graduates 54

VII. Electromechanical Curriculum Survey Overall Comparison . . 56

VIII. Electromechanical Curriculum Survey Technical Comparison 58

IX. Electromechanical Curriculum Survey Non-Technical Comparison 60

X. Survey of EMT Offerings in Junior Colleges 62

XI. Comparison of OSU EMT Curriculum Content with National Averages 63

XII. Chi-Square Analysis of National Average and OSU EMT Values. 65

XIII. Raw Scores on Industrial Qualifying Examinations Made by OSU Graduates 67

XIV. Rank Order of Scores Made on Industrial Examinations by OSU EMT Graduates and the Resulting Rank Order Correlation Coefficients 69

XV. Comparison of Population Means 71

XVI. Test of Differences Between Two Measures on Three Tests . . 73

Table | Page

XVII. Chi-Square Analysis of OSU EMT Graduates and Manufacturing Industry Reference Population 74

XVIII. Summary of National EMT Curriculum Practices 78

LIST OF FIGURES

Figure		Page
1.	Flow of Concepts in First-Year of EMT Curriculum	28
2.	Distribution of Average Contact Hours in the EMT Curriculum Studied	50
3.	Distribution of Average Semester Credit Hours in the EMT Curriculums Studied	50

CHAPTER I

INTRODUCTION

Modern industry depends upon engineers, technicians, and skilled craftsmen for most of its key manpower - from research to sales, from product development and production through supervision and management. The personnel who staff these positions are the products of an educational system that has come to play an increasingly major role in the nation's economic life. Technical institutes, community colleges, universities, and other educational institutions are as important today in our nation's industrial development as energy supply and transportation were in the past (1, p. 1).

Sweeping changes are taking place in American industry and in post-high school educational institutions which supply an ever increasing proportion of industry's technical manpower (2, p. 1). One specific result of the many technological developments is the creation of thousands of jobs at the technician level which require the completion of two years of post-high school technician education prior to employment (3, p. 1). These new and emerging technical occupations require skills and knowledge that cross traditional lines of subject matter (4, p. 201). Further, the advances in technology are creating semi-professional occupations with inputs of knowledge from two or more disciplines requiring greater emphasis upon science-based knowledge (5, p. 32). Electromechanical technology is one of these emerging occupations; and, as the name implies, successful technicians in this field use technical concepts from both electrical engineering and mechanical engineering.

Statement of the Problem

As part of the national effort to expand and modernize training programs for engineering technology, Oklahoma State University developed a new curriculum in the field of electromechanical technology. The system of instruction employed in this curriculum was distinctly different from the system commonly used in single-specialty technology programs. The general core of the curriculum was a sequence of singular concepts common to both electronic and mechanical technology. The first year consisted of courses which were totally interdependent and were carefully structured around the sequence of unifying concepts. The premise was that this approach would increase the efficiency of learning by assuring direct feedback and reinforcement. This increase in efficiency was deemed essential in order to encompass the large quantity of material to be covered when two disciplines were treated simultaneously.

Other schools throughout the nation have also responded to the need for electromechanical technicians. These schools developed electromechanical curriculums in accordance with their perception of the needs of industrial employers. It was to be expected that these curriculums would vary significantly in content. Part of this variance was caused by the viewpoints of the industrial employers toward the electromechanical job assignments.

The problem with which this study was concerned was to determine whether the Oklahoma State University curriculum differed significantly from that offered by other schools throughout the nation. And, whether the first graduates from the Oklahoma State University curriculum would be considered qualified for employment by various industrial organizations.

Purpose of the Study

The purpose of this study was to evaluate the curriculum in electromechanical technology developed at Oklahoma State University. Emphasis was placed upon a comparison of curriculums, and upon the qualifications of graduates of the Oklahoma State curriculum. This purpose can be further delineated by the following specific objectives:

a. To document and summarize the content of the electromechanical curriculum offerings available in 1970 in the United States.

b. To compare the content of the Oklahoma State University electromechanical curriculum with that offered by other schools throughout the nation.

c. To determine if graduates of the Oklahoma State University electromechanical curriculum met the minimum requirements for job entry of selected industries.

d. To determine if there was any significant difference between the first graduating class of the Oklahoma State University electromechanical curriculum and the graduates of single-specialty technology curriculums used as reference populations by selected industries.

Need for the Study

The need for this study was generated by the variety of curriculums developed by the nation's schools in response to the industrial need for electromechanical technicians. Further, it was considered most appropriate to attempt to determine the relative success of the electromechanical curriculum at Oklahoma State University because of its different approach.

As reported by S. M. Brodsky (6, p. 2), a study of the technical occupations in New York in 1962 revealed that 28 percent of the total number of technicians in the state were categorized as electro and mechanical engineering technicians. Of this total, one-third could be considered as electromechanical technicians. This surprising finding indicated that industry had found it necessary to train inter-disciplinary technicians from the typical single-field oriented pool of associate degree graduates. Projected numbers of jobs in New York state for electromechanical technicians by the year 1975 were listed as 19,211.

In 1965, a large computer manufacturer met with the representatives of six technical institutes and community colleges to discuss the need for technicians with electromechanical backgrounds. The needs of the expanding business equipment manufacturers alone indicated the desirability of developing associate degree programs in electro-mechanical technology (6, p. 3). Seven schools later formed a consortium to develop a curriculum approach to a two-year post-secondary program for the computer industry (7, p. 1). Each of the seven schools, after agreeing on the electromechanical curriculum content require-ments, "developed a curriculum approach reflecting its geographical area, the type of students being served, and the type of industries employing its graduates" (7, p. 1). The resulting curriculum developed by this consortium of schools was primarily oriented to applications in the business machine and computer industries (7, p. iii). The integration of curriculum content was provided by "scheduling rather than combining units of instruction for a team teaching approach" (7, p. vii).

In 1966, M. W. Roney (8) reported the results of a national field study of electromechanical occupations. The sample of 93 industrial organizations indicated a need for 50 percent more electromechanical technicians than their combined needs for electronic and mechanical technicians. From this study, a curriculum outline evolved providing a description of the level and scope of training deemed essential by this sample of the nation's employers.

The field study of electromechanical technician occupations revealed certain general guidelines for pre-employment education in this field. These general requirements were summarized as follows (9, p. 7):

1. The training should put emphasis on electrical and mechanical principles rather than on specific applications of these principles.

2. Communication skills are extremely important in the work of electromechanical technicians and should be given special attention in the training program.

3. A study of the interrelationship of electrical and mechanical elements of systems and devices should be central in the specialized technical courses of the instructional program. Whenever possible electrical and mechanical principles should be studied together, and not as separate entities.

4. Principles of electrical and mechanical physics are basic tools in the work of electromechanical technicians and all technical instruction should develop analytical skills for which these tools are

> fundamental. In addition, there is an increasing need for the technician to work with new applications of other physical sciences such as: optical equipment, thermal energy devices, hydraulic and pneumatic controls, and a wide variety of measuring instruments.

Roney (9, p. 9) reported that many of the principles which appear to be unique within a single technology, are also found in others. There are relatively few principles upon which all technical understanding is based. The curriculum developed from this study demanded an integrated teaching approach. This is the curriculum in use at Oklahoma State University.

The integrated teaching approach was discussed with industrial employers, with technical school administrators, and with technical teachers. Without exception, the opinion was expressed that such an approach seemed to offer the one means whereby the vast amount of technical material might be presented effectively within the time limit of approximately two calendar years.

In 1969, N. C. Harris (5, p. 32) of the University of Michigan reported that the need for semi-professional technicians in certain fields was critical. The number of electromechanical technicians needed in 1969 was estimated by Harris to be 100,000. This number was considerably higher than any other single engineering technician category. These and similar findings by other researchers lend support to the position taken by J. A. Patterson of Texas Instruments (10) in that "the need for electromechanical technicians has been proven."

It was apparent that some schools have curriculums aimed at the computer industry. Other schools have curriculums designed for the nation's overall industrial needs in this specialty. In short, the nation's two-year colleges and technical institutes have responded in a variety of ways to the need for electromechanical technology training. These differences in objectives with resulting implied differences in technical content, indicated a need for the study of current curriculum practices in electromechanical technology in the nation's schools. It was also felt that this nationwide study of current practices would enable curriculum planners, technical administrators, and technical teachers to make meaningful comparisons between individual curriculums and national practices.

One elementary criterion of success of any technology curriculum is that the graduates of that curriculum qualify for industrial employment. One simple means for determining whether this criterion has been satisfied is to determine the number of job offers received by the graduates. It was felt necessary to go beyond this simple technique. Therefore, the graduates of the Oklahoma State University electromechanical curriculum were compared with the comparison populations of selected industries as measured by the particular industry's qualifying examination. Not only would this technique determine whether the graduates qualify for employment, but also whether they differed significantly as a group from the particular industry's comparison population. It was expected that this study would provide information which would be useful in the design of additional research in similar areas.

Scope of the Study

This study was limited to the two-year post-secondary electromechanical technology curriculums. High school programs and four-year bachelor degree programs were not included. Every effort was made to include all schools throughout the nation offering this curriculum specialty. No attempt was made to make value judgments regarding the evident differences in the various schools' curriculums.

The evaluation of Oklahoma State University's electromechanical technology curriculum consisted of comparing the content with national practices, and of evaluating the students graduating from this curriculum by means of industrial qualifying examinations.

No attempt was made to evaluate differences between curriculums in teaching techniques, faculty qualifications, laboratory practices, appropriateness of facilities, or any of the other similar attributes which could be significant.

The particular industries were chosen arbitrarily because they administered a qualifying examination; because they were of a particular type; and because it was known they were willing to cooperate in this study. Even so, it was felt that the three chosen were representative of employer types throughout the nation: namely, research and development, business machine and computer manufacturing and service, and modern production facilities.

Only one group of students have completed the electromechanical technology curriculum developed at Oklahoma State University. This entire population was used in the study. Specific identification of the industrial comparison populations was not possible; however, their general description along with specific scores on the qualifying tests were made available. The qualifying tests were primarily aimed at the electronics technology graduate. This reflects the current industrial practice of hiring electronics graduates, then training them on-the-job in the mechanical aspects of the assignment.

A limitation of all occupational curriculum studies is the fact that the curriculums are constantly changing. As information was being gathered for this study, it was evident that minor changes were being made in several different curriculums.

Assumptions

The design of this study was based upon the assumption that the 1970 graduates of the Oklahoma State University curriculum would be similar to future graduates. The validity of this assumption is supported by the work of Astin (11, p. 51), who cites several studies which show that the characteristics of students at an institution remain stable over a period of years.

Another assumption of this study was that a change in one school's curriculum would result in little change in the overall national average. For example, one school might delete a general education requirement, but this would be countered by another school adding one.

It was further assumed that no major changes would be made in the curriculum content of the Oklahoma State University electro-mechanical technology curriculum during the next few years.

It was also assumed that the students made a genuine effort to answer all questions on the industrial examinations correctly. It was assumed that the graduating students were motivated at a level equal to that of the comparison populations. Finally, it was assumed that the learning effects from similar tests were negated by the random assignment procedure used.

Definition of Terms

Technician education is a planned sequence of classroom and laboratory experiences at the post-secondary level designed to prepare persons for a cluster of job opportunities in a specialized field of technology. The program of instruction normally includes the study of the underlying sciences and supporting mathematics inherent in a technology; and of the methods, skills, materials, and processes commonly used and the services performed in the technology. A planned sequence of study and extensive knowledge in a field of specialization is required in technical education, including competency in the basic communication skills and related general education. Technical eduation prepares for the occupational area between the skilled craftsman and the professional engineer (3, p. 6). Technician education and technical education are considered to be synonymous for purposes of this study.

Technician education curricula are structured to prepare the graduate to enter a job and be productive with a minimum of additional training after employment; provide a background of knowledge and skills which will enable him to advance with developments in the technology; and enable him, with a reasonable amount of experience and additional education, to advance into positions of increasing responsibility (12, p. 573).

Electromechanical technology consists of the selection and integration of specialized classroom and laboratory learning experiences in both the mechanical and electrical fields. Instruction is planned to provide preparation for responsibilities concerned with the design, development, testing and service of electromechanical devices and systems such as automatic control systems and servo-mechanisms, including vending machines, missile controls, tape-control machines, and auxiliary computer equipment.

The program of instruction is designed to develop understanding, knowledge, and skills which will provide the capacity to perform effectively in such areas as: feasibility testing of engineering concepts; systems analysis including design, section, and testing; application of engineering data; and the preparation of written reports and test results in support of mechanical and electrical engineers (12, p. 84).

Brodsky (6, p. 7) reported four areas of specialization for the electromechanical technologist. These areas were: maintenance and trouble-shooting, field service, manufacturing and automated processes, and research and development. The various types of electromechanical technicians can be operationally defined as those who have the education and training equivalent to completion of a two-year associate degree curriculum which qualifies them to perform functions implied in one of the four areas of specialization.

Thus, electromechanical technology refers to that part of engineering technology which deals with the inter-disciplinary treatment of electrical, electronic, and mechanical (including hydraulics and pneumatics) principles and applications (6, p. 9).

Technical institute is a post-high school institution training for occupations in which emphasis is placed on the application of the functional aspects of mathematics and science, or an officially designated, separately organized technical institute division of a four-year institution. The primary purpose of the technical institute is training for an objective other than a baccalaureate degree (13, p. 12).

Junior or Community College is an institution which offers the first two years of college instruction, frequently granting an associate degree, but not a bachelor's degree. Offerings include transfer or terminal programs (with an immediate employment objective) and also may include adult education programs. It is an independently organized institution (public or non-public) or an institution which is a part of the public school system or an independently organized system. The term does not refer to the lower division of a four-year institution, even if this lower division is located on a campus entirely different from the campus of the parent institution (14, p. 12-13).

Technical courses are the basic and advanced courses in the specific area of electromechanical technology (15, p. 12). These courses are those which are part of the technology as defined by a particular school's curriculum objectives.

Auxiliary technical courses are those technical courses which do not directly advance the curriculum objectives. Examples of these courses are drafting and drawing, hand skills and shop skills, and technical report writing.

General education courses are those courses in the electromechanical curriculum which can not be categorized as technical, auxiliary technical, mathematics, or science. Examples of these include: physical education, economics, literature, English, and psychology.

Theory hours (T) are the number of hours spent in theory or lecture each week.

Laboratory hours (L) are the number of hours spent by the student in laboratory activities each week.

Credit hours (C) are the number of semester hours granted for a particular course by a given school. One credit hour is usually equivalent to one theory hour per week, or two to three laboratory hours per week.

Contact hours are the number of hours the student is required to be in attendance; that is, the sum of the T and L hours per week.

Engineering technician is defined as a technician who works primarily in direct contact with creative engineering. He is usually capable of routine design and of making educated decisions within his specialty, he may or may not work under the direct supervision of an engineer (16, p. 2).

Industrial technician is defined as a technician whose specialty is closer to the production facilities of industry than to the creative engineering function. His efforts are directed toward the intensely practical problems associated with the production activities of the industry (16, p. 3).

CHAPTER II

REVIEW OF THE LITERATURE

The purpose of this study was to perform an evaluation of the electro-mechanical technology (EMT) curriculum at Oklahoma State University (OSU). To accomplish this purpose, two different approaches were employed. First, a comparison was made of the OSU EMT curriculum content with that of other schools. Then a comparison of the first OSU EMT graduates' performance on a battery of industrial qualifying examinations was made with the comparison population currently in use by the particular industry. An effort was made to group the review of literature into these categories. The review of literature pertinent to this study is, therefore, divided into the following three sections; current curriculum practices, the OSU EMT curriculum, and characteristics of the graduates.

Current Curriculum Practices

D. S. Phillips (3, p. 20) reported in 1968 that one of the most consistent findings from literature reviews relative to technical education was that research in this field has been limited. This remark became particularily relevent when a specific subdivision of technical education was chosen, and especially when that subdivision was an emerging occupation.

M. W. Roney (17, pp. 1-2) stated that technical education, like many other fields of education, suffers from a lack of definitive research. He explained his observation in this manner.

> It is paradoxial, in an age of technology where new scientific achievements are becoming almost commonplace, that we have no real curriculum theories in education. For a true theory must be based on established facts and we do not have enough facts in education on which to base a theory. Einstein's theory of mass-energy equivalence is a classic example of a pure theory. It consisted of known facts, meticulously assembled, carefully arranged in a new combination, and with a resultant prediction. His theory was capable of being tested and the results could be compared with the prediction. The contrast in education is sharp. We do not have comparable theories in education because we start with opinions--not facts. Any combination of opinions results in a new opinion -- not a theory. We have scientific data that enables us to put a man in exact orbit around the earth and to return him with still more accumulated data, but we do not have educational data that can be used to formulate a basic curriculum for the preparation of competent technicians -- or for that matter good citizens.

In November, 1968, W. J. Brooking (18) discussed at length the criteria for technician education. In discussing the general philosophy of the technical curriculum, he stated:

> Judging by the analysis of the special abilities which technicians must have, and the level at which they must be exercised in performing the required activities, it is evident that technician education must be of college level and intensity. A series of courses, their sequential arrangement, and the details of the plan for teaching each course will constitute the curriculum which implements the program (18, p. 56).

Brooking (18, p. 57) advocates a minimum of two years as the length of technical programs. Because of the time limitation, a loose collection of courses taken at random in cafeteria style will not adequately educate technicians. The sequence of the courses is most important. In sharp contrast to the arrangement of most baccalaureate curricula, the subject matter in a technical curriculum is arranged to blend smoothly from one group of courses to another, and to carry the student to a deeper understanding of his special field.

The relationship between laboratory time and class lecture time is of special importance. The laboratory experience, skills, know-how, and capability which are the most characteristic attributes of technicians cannot be learned in classrooms without laboratories (18, p. 57). As soon as the underlying theories are developed in the classroom, it should be incorporated into the laboratory work where it becomes a significant experience for increasing depth of understanding (18, p. 58).

Within the same philosophical frame of reference, M. W. Roney (17, pp 9-10) summarizes technical curriculum design principles into six general rules:

1. The curriculum should have at least 30 credit hours of specialized course work in the field of specialization and from 15 to 20 credit hours in mathematics and science.

2. The technical specialty should be introduced in the first term by one or two major courses.

3. Mathematics and science courses should be coordinated with technical courses whenever possible to introduce concepts as they are needed.

4. Auxiliary technical courses should be included to broaden the student's understanding of the technology.

5. Provision should be made for either individual or small group problem work during the final term to promote independent thinking and to test each individual's comprehension of the total curriculum content.

6. The total class and laboratory load for students should not exceed 30 hours per week and should not include more than 5 courses requiring extensive outside preparation.

A. C. Gillie (19) stresses that a cognitive approach should be used in a technical curriculum. It should be knowledge-based instead of skill-based. The student should be provided with educational experiences which will foster the growth of resiliency and flexibility. He amplified his meaning by stating:

> Perhaps the basic tenet behind modern day curriculum construction is that occupational programs should be designed such that the graduate enters the world of work with the real entry-level abilities - a mental attitude that assures him a maximum degree of resilience and flexibility. The one sure thing we know about the world of work he is entering is that fact that whatever it is when he enters it, it will surely be different shortly thereafter. Therefore he needs to be resilient so that he can be capable of responding constructively to on-the-job changes that occur with such great frequency. Furthermore, he must be flexible in his attitude, so that at the appropriate time he can leave the scene of his present work, enter into a period of additional education and/or training, and then return to the work world in a different job and role (19, p. 3-3).

Curriculum content was the subject of a study performed by Schill and Arnold (20). The common elements in the curricula of six technical programs were derived by means of a card-sort technique. One item that stood alone was the technical and scientific oral and written communications course. This is not the same as the usual fundamental English composition course. Other core courses identified include; numerical control and data processing, free-hand sketching, machine elements, use of standard convention, graphical techniques (including graphical differentiation and integration), basic drafting, mathematics through trigonometry, test equipment usage, transducer systems, and environmental testing (20, pp. 84-85).

Three hyphenated technologies were analyzed for content including electro-mechanical. It was observed that the hyphenated technologies "have no unique requirements of their own, but draw upon the technologies that contribute to their titles" (20, p. 86). Course areas found to be required in electro-mechanical technology included three electronic and four mechanical courses. These included; circuit analysis, servomechanisms and industrial controls, calibration and use of industrial instruments, metal forming, applied statics and strength of materials, pattern drafting and layout, and metal fabrication and welding (20, p. 89). The conclusion reached by Schill and Arnold was:

> To be able to offer programs in six technologies with a total of 37 courses, many of which would be included in the basic academic offerings of a junior college, takes a considerable burden off the typical post-high school educational institution in that each technology does not require a complete, unique curriculum (20, p. 91).

In 1967, a group of 71 knowledgable professionals participated in a project to develop an electro-mechanical technology curriculum for the State of New York (6). Four basic assemptions were made by this curriculum group:

> 1. The need for electro-mechanical technicians is sufficiently documented . . .
>
> 2. A two-year associate in applied science degree curriculum, which meets State Education Department requirements, can be designed to satisfactorily prepare electro-mechanical technicians.
>
> 3. Properly selected and oriented industrial consultants are competent to identify and specify the skills, abilities, knowledges, and understandings which various types and grades of electro-mechanical technicians are expected to use in industry.
>
> 4. Properly selected and oriented two-year college technology faculty members are competent to develop curriculum materials to implement the specifications established by industrial consultants (6, p. 4).

The result of this curriculum study was the formation of four slightly different curriculums in "general electro-mechanical technology" (6, p. 21).

A different trend developed with a group of schools which formed the Technical Educational Consortium, Inc. (7). This group of schools developed a "suggested curriculum" for electro-mechanical technology, oriented to the business machine and computer industries (7, p. iii).

In the Technician Education Yearbook 1967-1968 (21), there were 54 different schools from 23 different states claiming to offer either electro-mechanical curriculums or electro-mechanical courses. Two years later the 1969-1970 Technician Education Yearbook (22) was published. This edition listed 100 schools claiming to have electro-mechanical offerings. Thirty-three states were represented. A summary of these listings is contained in Table I.

The current list of schools having curriculums accredited by the Engineers Council for Professional Development (ECPD) indicated that only two of the 52 schools which have accredited electro-mechanical technology curriculums (23, pp. 82-84). These schools were Norwalk State Technical College, Norwalk, Connecticut, and Vermont Technical College, Randolph Center, Vermont. A third school had a curriculum entitled "Electrical Engineering Technology-Electronic Computer & Control Option" which was accredited by the ECPD. This school was Southern Technical Institute, Marietta, Georgia, and the curriculum was patterned after that developed by the Technical Education Consortium. Technical curriculums

TABLE I

COMPARISON OF 1967-68 AND 1969-70 LISTINGS

OF SCHOOLS WITH ELECTROMECHANICAL COURSES OR CURRICULUMS

State	67-68	69-70	New	Repeats	Deletions
Arizona	1	2	2	0	1
Arkansas	0	1	1	0	0
California	15	18	5	13	2
Colorado	0	2	2	0	0
Connecticut	3	3	1	2	1
Delaware	0	1	1	0	0
Florida	0	1	1	0	0
Georgia	1	2	1	1	0
Illinois	0	1	1	0	0
Idaho	1	0	0	0	1
Iowa	0	2	2	0	0
Kansas	1	1	0	1	0
Massachusetts	6	7	2	5	1
Michigan	1	3	3	0	1
Minnesota	4	3	1	2	2
Missouri	1	2	2	0	1
Montana	1	0	0	0	1
Nebraska	1	1	1	0	1
New Jersey	2	6	4	2	0
New Mexico	1	1	0	1	0
New York	0	5	5	0	0
North Carolina	0	2	2	0	0
Ohio	1	4	3	1	0
Oklahoma	0	2	2	0	0
Oregon	1	2	1	1	0
Pennsylvania	3	8	6	2	1
Rhode Island	0	1	1	0	0
South Carolina	0	1	1	0	0
Tennessee	1	1	1	0	1
Texas	1	4	3	1	0
Utah	1	2	1	1	0
Vermont	0	1	1	0	0
Virginia	2	3	2	1	1
Washington	3	4	3	1	2
Wisconsin	2	3	2	1	1
TOTALS	54	100	64	36	18

acceptable to the ECPD will normally be characterized by:

> a. At least the equivalent of one-half academic year of basic sciences, about half of which is mathematics and of which the mathematics includes carefully selected topics suited to each curriculum from appropriate areas of mathematics beyond college algebra and trigonometry, and including basic concepts of calculus.
>
> b. At least the equivalent of one-forth academic year of non-technical subjects including oral and written communications . . .
>
> c. At least the equivalent of one academic year of technical courses.
>
> d. The specification listed above total less than the minimum period of two academic years required to achieve an integrated and well-rounded engineering technology curriculum . . . (23, p. 80).

A review was made of the 35 college catalogs of the schools offering EMT curriculums. This review revealed wide differences in program objectives. A representative sample of the statements contained in the college catalogs follows.

Some of the schools stressed the value of the general education content of the EMT curriculum. Chabot College stated (24, p. 57).

> General education courses in each curriculum are constructed to broaden the student's understanding of himself, his government and its Constitution, and the world. It is intended that he will develop the skills he needs and a sense of personal and social responsibility necessary to citizenship in a democracy.

East Los Angeles College stated that the two-year post-secondary education should aid the student in "acquiring a better understanding of himself and his adult responsibility in preparing himself for his vocation" (25, p. 42).

Other schools did not stress the general education portion of the curriculum. For example, Arapahoe Junior College stated

(26, p. 33) their program "provides a student with an opportunity to acquire a saleable skill in the ever expanding area of technology." This catalog further declared, "the ultimate goal is that upon completion of the program the student will manifest the basic requirements needed to enter employment" (26, p. 33).

Some schools stressed the transfer possibilities. Massasoit Community College's pamphlet stated:

> Students that have completed satisfactorily the requirements for the Associate Degree in any of the above fields may then transfer to a senior college for the completion of a Bachelor of Science degree (27).

This statement immediately preceeded the curriculum for electronic technicians and electro-mechanical technicians.

Mount Wachusett (28) made similar claims:

> Mastery of this curriculum prepares graduates for employment as highly skilled technicians in a broad field of Electro-Mechanical Technology. It may also provide those students who register high-level achievement the opportunity to transfer to a program leading to a Bachelor's degree in Engineering at a senior college (28, p. 36).

Other schools who mentioned transfer in their catalogs were less optimistic. North Shore Community College's catalog stated:

> Students who elect those curriculums which are designed for immediate entry into a vocational field should remember that in some programs there are certain specialized courses which may not prove acceptable for transfer to four-year colleges and universities (29, p. 45).

The level of the various curriculums were evident from the catalog comments. Some schools were attempting to graduate an engineering technician capable of operating at the upper end of the spectrum. Others were aiming at the low end of the industrial technician spectrum. The City College of San Francisco catalog stated:

> Graduates who have satisfactorily completed the curriculum in Electro-Mechanical Technology . . . are qualified for employment as technicians engaged in manufacturing, installing, and maintaining electrical and mechanical equipment; and also for employment as electro-mechanical draftmen. With experience and training, graduates may advance to positions such as those of instrumentation technician, . . . and manufacturer's field representative (30, p. 355).

It was quite evident that the definition of an electro-mechanical technician and his job assignment were viewed differently by the various schools. Some schools were aiming at computer engineering technology; some at instrumentation and control; and others at the general aspects of the technology.

Foster (31) performed a quantitative study of 81 curriculums in electronics and in mechanics. He found that the two-year colleges strived for a broad education. The private junior colleges were liberal-arts oriented and seemed "somewhat ill-at-ease in engineering technology education". The Technical Institutes emphasized techninal education with a minimum of credits in humanistic-social studies. Foster's conclusion was that "each type of institution tends to offer its own form of education, despite the fact that all of them confer an associate degree in engineering technology."

The OSU EMT Curriculum

Educational planning for emerging occupations can be especially effective when the findings of well-planned research studies are used to modify, extend, or reorient existing educational services. Research in occupational education should uncover new and more effective techniques of occupational analysis and translate the findings of this analysis into new educational programs. According to Roney (32, p. 1), this is a four-step process; occupational analysis, program planning, program development and testing, and documentation and dissemination of results.

This process was followed in the development of the EMT curriculum at OSU. The field study of occupational needs was conducted in two parts. The first part consisted of an in-plant study of the electro-mechanical technician occupations to determine what skills and knowledge combinations are required and whether or not existing schools are providing these requirements. The report (8) of this phase of the study indicated the urgent need for technicians with educational backgrounds significantly different from that obtained in existing programs.

The second part of the field study obtained a measure of the quantitative need for electro-mechanical technicians. During the course of the field interviews, the research consultant probed for information and attitudes regarding the skill and knowledge required in industrial settings (32, p. 2). A panel of consultants with national representation provided advisory services and assisted in planning and conducting the field study.

The second step of the research project (program planning) incorporated the findings of the field study into a proposed curriculum plan. This plan differs significantly from any known technical education program and incorporates a number of ideas which resulted directly from the suggestions made by employers during the interview phase of the field study (32, p. 4).

The need for equal attention to mechanical and electrical principles throughout the training program was underscored by employers. Technicians are needed with sufficient knowledge to make judgments where both principles are involved. Specialists tend to avoid decision-making responsibilities where the two elements are interdependent (32, p. 4).

Employers stressed the importance of the technician's responsibility for the communication of facts and ideas. The need was not so much for grammatical expertise as for technical accuracy (32, p. 6).

It was apparent that the simple strapping together of traditional courses would not fulfill the needs uncovered during the field study (33). Early in 1968, a research contract was granted to The Technical Education Research Center, Inc. (TERC) to "develop, pilot test, and evaluate interdisciplinary post-high school technical education programs in Electro-Mechanical Technology" (34, p. ii). This development and pilot test was to be performed, in part, at Oklahoma State University under the guidance of M. W. Roney and D. S. Phillips, and was based upon the field study results (8) (9).

The resulting curriculum (step 3 - program planning) applied the known principles of technical curriculum design to the findings of the occupational study. Correlation of the occupational analysis with the program planning occured throughout the project (32, p. 6).

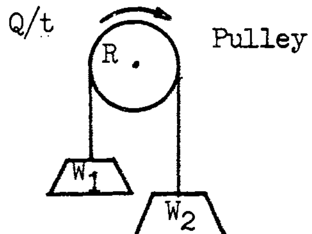
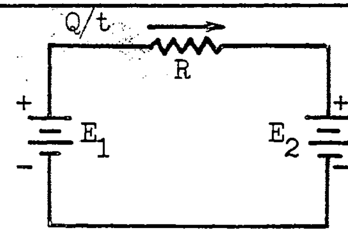
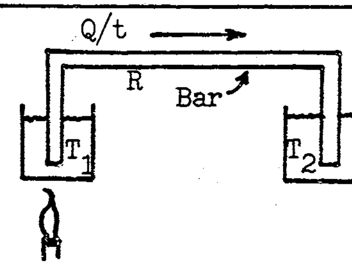
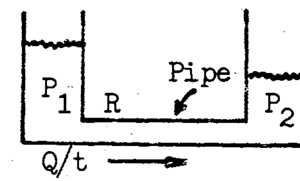
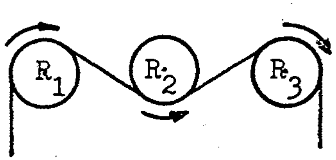
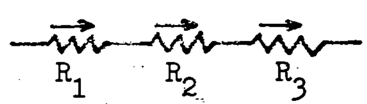
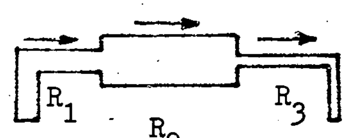
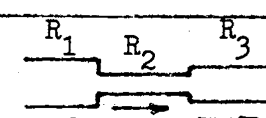
The EMT curriculum developed utilized a system of instruction that was distinctly different from the system commonly used in single-specialty technology programs. The unifying element of the curriculum was a sequence of singular concepts common to both electrical and mechanical technology. The first year of the two-year curriculum consisted of six subject areas; mathematics, physics, electronics, mechanics, electro-mechanics, and technical reporting. It must be stressed that these courses were totally interdependent; they were carefully structured around ten key concepts (35, p. 2):

1. Differential Forces
2. Flow Rates
3. Real Opposition (resistance)
4. Energy Storage
5. Time Constants
6. Impedances
7. Resonances
8. Waves and Fields
9. Amplification
10. Feedback and Stability

These concepts were introduced and illustrated in the physics classes, repeated as specific applications in separate electrical and mechanical classes and laboratories, then, brought together again in the electro-mechanical laboratory and class. Selected devices and systems of today's industry were used in the laboratory activities. An illustration of this approach would be that if amplification were the concept being taught, it would first be treated in a general sense in the physics class. Here, many broad applications would be covered. Then, it would be studied in discrete electronic and mechanical settings such as electrical, hydraulic, pneumatic, and thermal applications. Then, the electro-mechanical laboratory would provide an industrial system or subsystem which employed one or more of these applications (35, pp. 2-3). The purpose of this approach was to have the student learn the concept in a variety of physical settings. This assured adequate reinforcement and stressed the unity of the basic concepts. Table II (33, p. 10) illustrates the applications of the unified concept of resistance in mechanical, electrical, therodynamic, and hydraulic settings.

The mathematics class was closely coordinated with the

TABLE II APPLICATIONS OF UNIFIED CONCERPTS (RESISTANCE)

 MECHANICS	 ELECTRICITY	 THERMODYNAMICS	 HYDRAULICS
$\Delta F = W_1 - W_2$ pounds	$\Delta E = E_1 - E_2$ volts	$\Delta T = T_1 - T_2$ degrees	$\Delta P = P_1 - P_2$ Lb/in^2
Q = feet t = seconds Q/t = feet/sec velocity	Q = coulombs t = seconds Q/t = coulombs/sec current	Q = BTU's t = min Q/t = BTU/min flow	Q = gal t = min Q/t = gal/min flow
$R = \frac{\Delta F}{Q/t}$ Friction	$R = \frac{\Delta E}{Q/t}$ Resistance	$R = \frac{\Delta T}{Q/t}$ Resistance	$R = \frac{\Delta P}{Q/t}$ Resistance
 $R_T = R_1 + R_2 + R_3$	 $R_T = R_1 + R_2 + R_3$	 $R_T = R_1 + R_2 + R_3$	 $R_T = R_1 + R_2 + R_3$

electrical, mechanical, and electro-mechanical activities during the first year. The mathematical concepts and knowledges required in the technical courses were introduced as the specific need arose. These concepts included algebra, geometry, trigonometry, and calculus. It was found that mathematics was much more interesting to the student when it was possible to illustrate and apply the same formula or construct in a variety of practical applications (36, p. 5).

It was found that the skills of communications, so vital to the success of technicians in this new occupation, could be taught more effectively. The concentration upon one concept at a time gave the student a solid base for his thinking, speaking, and writing. The necessity for clear, accurate, and concise description was immediately apparent to him (35, p. 3).

The flow of concepts in the first year of this curriculum is illustrated in Figure 1. Notice that in this system physics holds the central position and serves to disseminate the basic technical concepts among the specialty courses (37, p. 3).

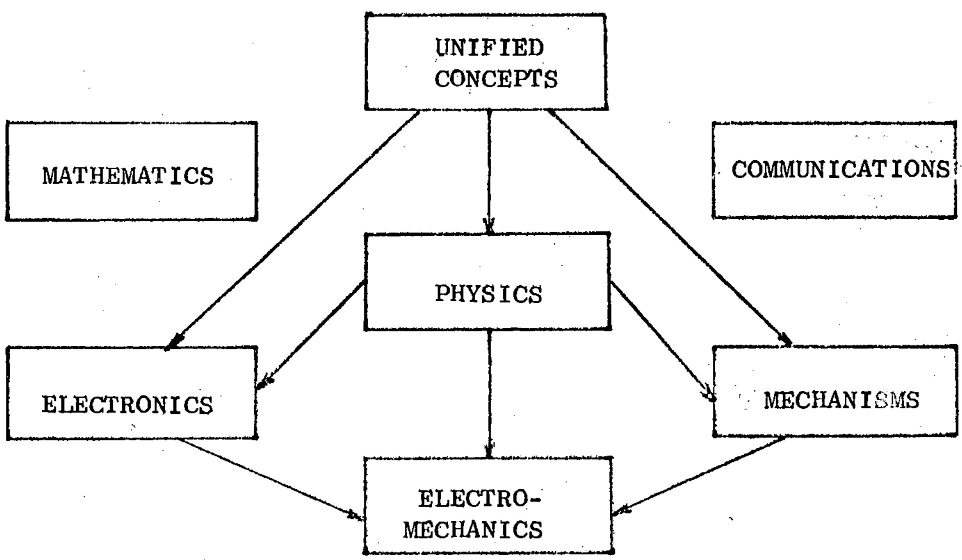


Fig. 1 Flow of Concepts in First-Year of EMT Curriculum

It was believed (37, p. 5) that this approach resulted in the following advantages:

1. Equal emphasis is placed upon electrical and mechanical applications.

2. Areas of overlap may be easily identified and appropriately exploited.

3. Important topics outside both electronics and mechanics may be identified and dealt with in the physics and electromechanical courses.

4. The time required for training can be held to two academic years.

5. Broad conceptual base allows subsequent continuation of education (37, p. 5).

The second year of the EMT curriculum continued to emphasize the basic concepts, but stressed their use in total electro-mechanical systems (33, p. 12).

Characteristics of the Graduates

In September, 1968, the first graduates of the OSU EMT curriculum enrolled. Some of the characteristics of these students were (38, pp. 3-4):

1. All students are Oklahoma high school graduates.

2. Ninety percent of the students are recent high school graduates. (Fifty percent of the students are from small high schools and the other half from large high schools.)

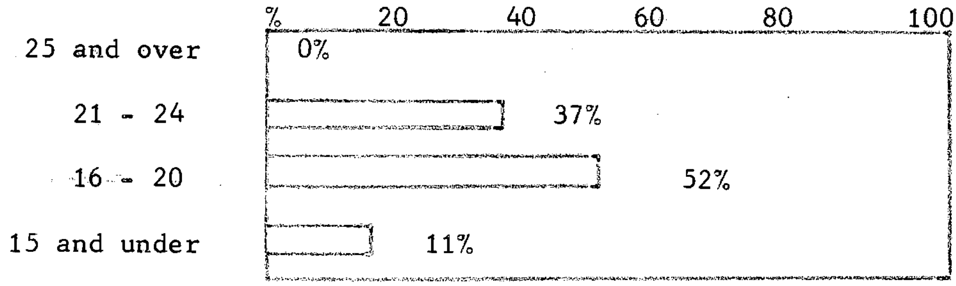
3. Ninety percent of the students are single.

4. The students live in:
   a. College dormitories and take their meals in the dormitory dining hall (55%).
   b. University apartments and prepare their their meals at home (30%).
   c. Fraternity hourses (10%).

5. The distribution of the composite ACT scores for electromechanical students is:

Percent of Students in
Each Group

Composite ACT



6. All of the students had completed:
   a. Two semesters of high school algebra
   b. Two semesters of high school geometry
   c. Two semesters of high school science (physics or chemistry) (38, pp. 3-4).

The mean composite ACT score for the group was 19.4 with a range from 13 to 24. The average for all high-school seniors taking the ACT tests in Oklahoma is approximately 19.0. The class of students enrolled in the OSU EMT program could be considered average in ability (4, p. 204).

When these students were compared with the national average of college-bound seniors, it was found that 22 percent ranked in the lowest quartile; 52 percent were in the next to the lowest quartile; 26 percent came in the next highest quartile; and none were in the highest quartile (39, p. 2). The findings of a study by Cross (40, pp. 11-14) seemed to indicate that the academic characteristics of the OSU EMT graduates were approximately the same as the typical two-year or junior college entering student.

Summary

From the review of literature it was evident that curriculums in electro-mechanical technology were born in the 1960's. There was much confusion regarding the definition and delimitation of electro-mechanical technology. Some schools considered the technology to be broad based and fundamental; others considered it to be in the computer engineering technology area; and still others considered it to be primarily servo-mechanisms and instrumentation oriented. These different views were reflected in the purposes and objectives contained in the college catalogs. Schill and Arnold (20, p. 86) took the view that electro-mechanical technology had no unique requirements but drew upon electronics technology and mechanical technology for its content. This study was of the current and past practices in Illinois. The national study conducted by Oklahoma State University (8) reported results diametrically opposed to this view. Myron Tribus (41), Dean of Engineering at Dartmouth, was of a similar opinion:

> Subjects should be taught in a unified way. . . There is not enough time to teach things as though they were specialized when in fact they are general. The problems of engineering do not occur according to the various subdivisions of knowledge that characterize the separate professional branches. The distinction between the branches of engineering has been disappearing continuously and within the next decade the process will be accelerated. The schools should lead, not lag behind this process.
>
> Engineering curricula should teach those fundamentals which will be of value ten years after graduation. It should not be necessary for the engineer to return to school to understand and use new ideas as they develop (41, p. 3).

Although Dean Tribus was referring to engineering, the same philosophy is applicable to engineering technology.

Within a two year span there was almost a 100 percent increase in the schools stating they had electro-mechanical curriculums or courses. However, 33 percent of the schools making this claim in

1967 were not claiming to do so in 1969.

The summary of the literature available regarding the OSU EMT curriculum indicated a deliberately planned approach different from the conventional. This conceptual approach was developed to achieve definite, defined purposes. The first graduates of this curriculum appeared to be average both when compared with fellow OSU students not in the curriculum and when compared with occupational students in the nation's junior colleges.

CHAPTER III

METHODOLOGY

The purpose of this chapter is to describe the design of the study, the methods used for collecting data and the techniques used for analysis of the electro-mechanical technology curriculum at Oklahoma State University. To achieve this purpose, the following steps were taken; determination of EMT curriculum practices in 1970 in the United States, comparison of OSU curriculum content with national averages, examination of OSU EMT graduate employability, and comparison of OSU EMT graduates and industrial populations. The remainder of this chapter will be a discussion of these steps.

Determination of EMT Curriculum Practices

Efforts were made to contact all schools in the nation offering two-year, post-secondary curriculums in electro-mechanical technology. A letter of inquiry was written to each of the 100 schools listed in the Technician Education Yearbook (22, pp. 12-112) as offering courses in electro-mechanical technology.

This letter requesting program details was also sent to the schools forming the Technical Education Consortium, Inc. (7, p. iii) and to other schools suggested by individuals during the study. The complete list of schools contacted is given in Appendix A.

To assure 100 percent return of information, telephone calls were made to the technology department of the school to obtain clarification. Seventy-five long distance telephone calls were made during this survey.

Catalogs and pamphlets were received from all schools except those clearly stating that they did not offer an EMT curriculum. A total of 78 catalogs were received and reviewed for curriculum content and objectives. Following the analysis practice initiated by Roney (15, pp. 10-17), the subject matter was grouped into five major areas; technical, auxiliary technical, mathematics, science, and general education. Problems arose when making distinctions between these five groups, especially between the technical and the auxiliary technical categories. Two criteria were used to aid in this differentiation. First, the overall objective of the EMT curriculum as outlined in the school's literature was considered. For example, if the objective of the curriculum was to prepare students for employment as computer engineering technicians, courses directly applicable to this objective were grouped as technical courses. Secondly, courses in the areas of drafting, drawing, engineering graphics and layout, technical report writing, and shop skills were grouped as auxiliary technical.

For each course a determination was made of the number of hours per week spent in theory (T), the number of hours per week spent in laboratory (L), and the number of credit hours awarded (C). For analysis purposes, these T, L, and C hours were converted to a semester base, when listed by quarter hours, and were rounded to the nearest tenth of a semester hour. A listing was made of each school's curriculum in both time sequence and by subject matter grouping with the TLC hour totals.

Tabulations were made showing the TLC hour findings. The tabulations were grouped as follows:

Total credit hours.

Technical courses.

Auxiliary technical courses.

Mathematics courses.

Science courses.

General education courses.

Tabulations were also made of the number of 1970 graduates estimated by the schools.

A tabulation was prepared showing the percentage of the total credit hours devoted to each of the five major subject matter areas. Included in these were the percentage of the curriculum devoted to total technical courses (technical plus auxiliary technical).

For each of these tabulations, the maximum, minimum, mean and standard deviation were determined.

In addition to the tabulations of curriculum content and number of graduates, information was listed regarding the following:

Type of science (physics, chemistry, or both).

Level of mathematics (whether or not calculus).

Physical education (required or not).

Computer emphasis (indicated or not).

Computer emphasis (indicated or not).

A summary of pertinent data in terms of credit hours, contact hours and percentages of total curriculum was prepared.

<u>Community/Junior College</u>

A survey of junior colleges was made because the responses to the initial letters indicated that less than three percent of two-year schools were offering EMT curriculums. To confirm or deny this percentage, a sampling plan was formed patterned after the work of Griffin (43, p. 219).

A list of the two-year colleges was obtained from the American Association of Junior Colleges and used as the population. It was decided that a confidence level of 95 percent would be satisfactory for this study. According to Griffin (43, p. 501) this confidence level and population size indicated a sample size of 95.

The sample of 95 schools was chosen from the population of 992 schools using Griffin's Table (43, pp. 465-468) of random numbers. The sample of schools chosen in this way is given in Appendix B.

A letter (Appendix C) was sent to each of these schools, requesting them to place a check mark beside one of four statements relating to EMT courses and curriculum.

Based on the responses a table was constructed showing the various options, the numbers of schools responding to each option, and percentage of the total schools for each option.

Comparison of OSU Curriculum Content with National Averages

It was thought to be worthwhile to determine not only the current practices in EMT curriculums, but also to examine the extent to which the OSU EMT curriculum content differed from the national averages. In order to give an indication of the magnitude and significance of these differences, a standardized score, Z, was computed which expressed the variation from the mean in standard deviation units. This computation was performed by using the relationship

$$Z = \frac{(0-X)}{S}$$

where X is the national average; O is the OSU value; and X is the standard deviation of the scores in question. The results of this computation were tabulated.

In addition to the computation of Z-scores for the individual curriculum variables, a goodness-of-fit chi-square analysis was performed on the distributions of credit, theory, and laboratory hours. In this analysis, the OSU EMT curriculum distribution was compared with the national average distribution. The statistic employed was taken from Bertstein (42, p. 18).

$$X^2 = \sum_{i=1}^{n} \frac{(0_i - E_i)^2}{E_i}$$

where 0_i is the OSU value and E_i is the national average. The level of significance was chosen to be 0.05.

Determination of OSU EMT Graduate Employability

As reported by Phillips and Briggs (44, p. 16), one of the primary evaluation techniques used in technical education has been the students' success in obtaining employment. This portion of the study was concerned with determining whether or not the graduates of the OSU EMT curriculum would be considered employable by three industries. This determination was based upon the scores made by the graduates on the particular industry's qualifying examination. It must be emphasized that a qualifying examination is only one of many facets of the employment process. Applicants passing these examinations are sometimes not hired; and, conversely those failing the examinations are sometimes hired.

The results of the field study by Roney (8, pp. 13-25) indicated that industrial activities concerned with business machines and computers, component manufacturing, and research and development, were the largest users of electro-mechanical technicians. One organization of each of these three types was asked to participiate in the study. Their selection was based upon the following criteria; (a) each industry employed in excess of 1,000 engineering technicians; (b) sizable numbers of electro-mechanical technicians were employed by these industries; (c) qualifying examinations were used by the industry during its employment process; and (d) the industry agreed to permit the investigator to use their examinations and to furnish supporting information relating to these examinations. Because the examinations are currently in use, all three industries asked that the tests not be reproduced in this report.

Research and Development Company Examination

The research and development firm chosen was engaged in advanced scientific and engineering activities as a non-profit contractor for the government. Most of the professional staff hold advanced scientific or engineering degrees. The technicians working with this staff were often engaged in scholarly type activities. This industry preferred technicians and professionals with extremely high grade point averages. The preferred qualifying score on their examination was relatively high.

The qualifying examination consisting of 77 questions was designed in the mid-sixties for electronics technicians. Several questions concerning mechanics were present in the physics section of the test. The number of questions for each section of the examination were:

12 - Mathematics	5 - Industrial electronics.
7 - Physics.	6 - Instrumentation.
6 - Dc and ac.	5 - Communications.
7 - Vacuum tubes.	5 - Microwave.
7 - Solidstate devices.	5 - Modern electronics.
6 - Power sources.	6 - Circuit analysis.

There was no time limit placed upon persons taking the test.

Some typical multiple-choice questions, without the answer option, found in this examination were:

> A puck whose mass is one slug is traveling 10 feet per second when it hits a two slug puck directly in its path. If they stick together on impact, the velocity of their combined masses is:
>
> Which one of the following changes would not increase the rate of heat passage though a barrier:
>
> More gain could be obtained using transformer coupling between transistor amplifiers than RC coupling because:
>
> Which one of the following is the Boolean Algebra expression for the relay circuit of Figure 18?

The minimum score required for employment was 41. A score of 46 or better gives assurance that the prospective employee is equivalent to an "A" or "B" graduate of a two-year electronic technology curriculum and this 46 is the preferred score. This company has usually limited its recruitment to schools accredited by the Engineering Council for Professional Development.

<u>Component Manufacturing Company Examination</u>

This firm has been involved in the manufacture and distribution of solidstate devices, components, and related assemblies. The functions and operations performed by the professional staff and by the supporting technicians are quite varied. Large numbers of electronic technology graduates are used at many different levels of employment. These levels range from simple production-line functions to advanced levels of applied research. Many of these areas are indeed electro-mechanical in nature.

The examination consists of 54 questions about many phases of electronics. There is no time limit and most persons who have taken the test have required a little over one hour to finish. Typical of the questions found on this examination were as follows (when the question quoted is a multiple-choice type, the answer options have been omitted):

> The voltage gain of an amplifier is 100. This gain expressed in decibels is:
>
> Draw the circuit required to make a 50-microampere full-scale meter read 300 volts full scale.
>
> In the circuit above, a positive 2 volts dc potential is measured between V2 control grid and ground. This abnormal reading could be caused by:
>
> The input wave to be examined on a cathode-ray tube is most often applied to:
>
> In the astable multivirator below, which of the following waveforms would you expect to find at point A?

The minimum qualifying score on this industrial examination was 42, and preferred score was 55.

<u>Business Machine and Computer Company Examination</u>

The part of this firm represented was concerned with the field engineering services performed for their customers. These jobs have been concerned with the maintaining, repairing, and modifying of electronic computers and the peripheral equipment associated with them.

The qualifying examination consisted of a technical knowledge section, an aptitude test, and a mechanical knowledge section. The three parts were administered separately and were timed. The technical knowledge and the aptitude test took 45 minutes and the mechanical test took 30 minutes.

The technical knowledge test consisted of 48 questions. Typical questions on this multiple-choice test were:

> The filament of a 6A8 radio tube requires 0.3 ampere. Six of these are connected in parallel. The number of amperes that must be furnished to light these filaments is:
>
> The full wave rectifier illustrated below has an error. The error in this circuit is:
>
> A piece of steel is put through the process of heating and then quenching in order to:
>
> In the diagram below, crank arm C revolves at a constant speed of 400 RPM and drives lever AB. When lever AB is moving the fastest, arm C will be in position ________:
>
> The circuit below receives a square, positive 10 volt pulse that is one millisecond in length. The output pulse is best illustrated by which of the following?

The minimum qualifying score on this portion of the examination was 25. This was the only score given; there was no preferred score listed.

The aptitude test consisted of 60 multiple-choice questions. There were three kinds of problems in the test: number series, figure series, and arithmetic problems. In each number series problem, a sequence of numbers was given, and five options listed for the next number in the series. In the figure series problems, four figures are shown and the examinee chooses the one of five other figures which would appear next in the series. The arithmetic problems are ordinary computational problems. The minimum qualifying score on this test was 35 and the preferred score was 40.

The mechanical test used was a standardized test devised by Daniel R. Miller (45). According to Miller (45, p. 3), the test was designed to measure aptitude for "solving the types of mechanical problems involved in the operation, maintenance, repair, and design of various types of machinery." There were 35 multiple-choice items each included a drawing of a mechanical device. With each drawing was a statement concerning some aspect of the machine's operation. The examinee chooses the most correct of the three given responses.

Analysis Procedure Relating to Employability

This portion of the study was concerned with the hypothesis that the graduates of the OSU EMT curriculum would not differ significantly from the single specialty electronics graduates used as industrial comparison populations. Each of the industrial qualifying examinations has a different reference population, necessitating separate treatment of each examination.

The population sample for this study included the total number of students graduating from the OSU EMT curriculum in May, 1970. The control or comparison group was the graduates of single specialty technology curriculums from a variety of technical schools.

The measuring instruments were the electronics and mechanics industrial tests discussed in the prior section of this chapter. Since the comparison populations vary for each test, separate discussions of these populations have been included.

The research and development industry used as its comparison population one hundred 1967 graduates of electronic technology curriculums. These graduates were from selected ECPD accredited curriculums in schools considered as having excellent reputations by the industrial organization. The criteria used during the validating process were the students' grade point averages. The correlation between the grade point averages and the qualifying examination scores was significant at the 0.01 level. In 1968, rechecks of the test's validity gave similar results. The comparison population had a mean of 44, with a standard deviation of 3.5.

The components manufacturing industry comparison population consisted of two hundred twenty seven 1969 electronics graduates who had applied for positions with this industrial concern. All of these applicants possessed either an associate degree or a certificate in electronic technology. These 227 graduates represented over 30 different schools. These graduates had the following scores on the qualifying examination: A mean of 57.60 and a standard deviation of 8.49.

The business machine and computer industry comparison populations were different for each of the three tests comprising their qualifying examination. In each instance, employees having less than 15 months service were used as the comparison population. The technical test population had a mean of 27.36 and a standard deviation of 4.80, they numbered 154. The aptitude test comparison population had a mean of 41.02, a standard deviation of 6.70 and numbered 162. While for the mechanical test comparison population, the mean was 27.17, the standard deviation was 5.01

and it numbered 39.

In summary, the composition of the populations used for comparison purposes had the following characteristics. The research and development industry used entire graduating classes of selected schools. The manufacturing industry used 1969 graduates who applied for employment. The computer industry used recently hired employees.

The tests were administered to the OSU EMT graduates in May, 1970, using the same administering procedures employed by the particular industries.

One analysis was performed by computing the Spearman rank correlation coefficient for each pair of tests. The technique employed followed that recommended by Bernstein (42, pp. 69-70). The test scores obtained by the OSU EMT graduates were translated into rankings. These rankings were tested for significant correlation at the 0.05 and at the 0.01 levels.

In another analysis of the data, the hypothesis was tested that there was no signficiant difference between the mean score made by the OSU EMT graduates and the mean score made by the industrial comparison population on a given examination.

The t-score for each test was computed. Statistical tables (42, p. 112) were consulted for the value of t at the 0.05 significance level. If the absolute value of the computed t was less than that corresponding to the 0.05 level, the null hypothesis was not rejected. If the absolute value of the computed t-score was equal to or greater than that of the 0.05 signifiance level, the null hypothesis was rejected. When no correction is made for degrees of freedom, the most severe test is imposed; that is, with large degrees of freedom t at the 0.05 level has its minimum value (1.96). During the analysis, this value of t was kept in mind. No corrections for degrees of freedom would be made unless this value was exceeded.

Approximately one month prior to the administering of the test batteries, the recruiters for the business machine and computer industry had administered the three-test battery to the OSU EMT graduates. This added to the similarity between the graduates and the industrial comparison population because the employees of this industry used as the comparison population, had also taken the three tests earlier. The time lapse between the initial taking of the tests and the second taking for the industrial employees varied from one to fifteen months. The time lapse for the OSU EMT graduates was one month. An analysis was performed to determine if there was any significant improvement on the test when it was taken the second time. This test was based upon the assumption that the difference between scores/made by various individuals would be normally distributed. That is the null hypothesis was that the group did not improve. The level of significance chosen was 0.05. There were 16 students who took these three tests both times which gave a degree of freedom of 15. If the computed t-score was less than 2.13 the null hypothesis would be accepted and the assumption made that no significant improvement occured. This procedure was taken from the work of Bernstein (42, p. 36).

Overall Analysis

Chapter IV, Presentation and Analysis of the Data, considers the data collected in this study in the following manner:

1. A separate analysis of the curriculum practices in electro-mechanical technology in 1970 in the United States.
2. A comparative analysis of the OSU EMT curriculum content with the national practices.
3. An analysis of the employability of the OSU EMT graduates.
4. A comparative analysis of the OSU EMT graduates and selected industrial population samples.

CHAPTER IV

PRESENTATION AND ANALYSIS OF THE DATA

This chapter is organized around the four specific objectives of the study which were outlined in Chapter I.

Electromechanical Technology Curriculum Practices

Each of the 100 schools listed in the Technician Education Yearbook (22) as having electro-mechanical technology courses or curriculums were contacted with a request for details of their curriculum. In addition to these 100 schools, four others were contacted. DeVry Technical Institute and Southern Technical Institute were members of the Technical Education Consortium, Inc. and had participated in the development of electro-mechanical curriculums. These two schools were listed in the Yearbook (22) but had not chosen to state they offered electro-mechanical programs. Information revealed during the study indicated that Phoenix College and San Antonio College also offer EMT courses. They were therefore included in the study. A summary of the results is shown in Table III. Of the 105 schools queried, 35 offered electro-mechanical technology curriculums and 70 do not. The complete list of schools contacted is found in Appendix A.

Some of the 100 schools listed in the Yearbook did not claim to offer a complete EMT curriculum. There were nine schools which

TABLE III

EXTENT OF ELECTRO-MECHANICAL TECHNOLOGY CURRICULUM+ OFFERINGS IN THE UNITED STATES

State*	Schools Queried	Electro-mechanical Yes	Electro-mechanical No
Arizona	3	1	2
Arkansas	1	0	1
California	18	6	12
Colorado	2	1	1
Connecticut	3	2	1
Delaware	1	0	1
Florida	1	0	1
Georgia	3	1	2
Illinois	2	0	2
Iowa	2	0	2
Kansas	1	0	1
Massachusetts	7	5	2
Michigan	3	1	2
Minnesota	3	1	2
Missouri	2	0	2
Nebraska	1	0	1
New Jersey	6	3	3
New Mexico	1	1	0
New York	5	1	4
North Carolina	2	1	1
Ohio	4	0	4
Oklahoma	3	1	2
Oregon	2	1	1
Pennsylvania	8	2	6
Rhode Island	1	0	1
South Carolina	1	1	0
Tennessee	1	0	1
Texas	5	1	4
Utah	2	1	1
Vermont	1	1	0
Virginia	3	1	2
Washington	4	1	3
Wisconsin	3	1	2
Totals	105	35	70

* States not listed have no school claiming this specialty

+ Electro-mechanical Technology Curriculum is limited here to the post secondary, two or three year curriculum.

claimed to offer extension courses only. The survey revealed that 31 of these 100 schools have operating EMT curriculums. In addition, five schools operated at the high school level and two at the baccalaureate level and were excluded from this study. There were 53 schools listed as having EMT offerings but no evidence was found in this study of their existence. Including the programs identified from sources other than the Technical Education Yearbook, a total of 35 operating EMT curriculums were found. Appendix F contains these.

Two of these 35 curriculums were excluded from the TLC analysis. Oregon Technical Institute offers a three and a four year program. The four year bachelor's degree program was automatically excluded, and, since this was the only three-year program found, it was also excluded from the TLC analysis. In addition to Oregon Technical Institute, the curriculum at Dunwoody Industrial Institute was excluded because its format did not lend itself to the TLC analysis technique. These exclusions are arbitrary and administrative and in no way reflect upon the quality of these two programs. As the result of these two exclusions, there were 33 curriculums subjected to analysis.

The average number of contact hours spent in technical, auxiliary technical, mathematics, science, and general education courses is shown in Figure 2. The average number of credit hours spent in these same groupings is shown in Figure 3. The largest difference between these two analyses is in the total technical areas. The average EMT curriculum had 54.5 percent of the credit hours to be in technical or auxiliary technical courses, but these same courses require 62 percent of the contact hours. This is caused by the time the student spends in technical laboratory activities.

1582 CONTACT HOURS

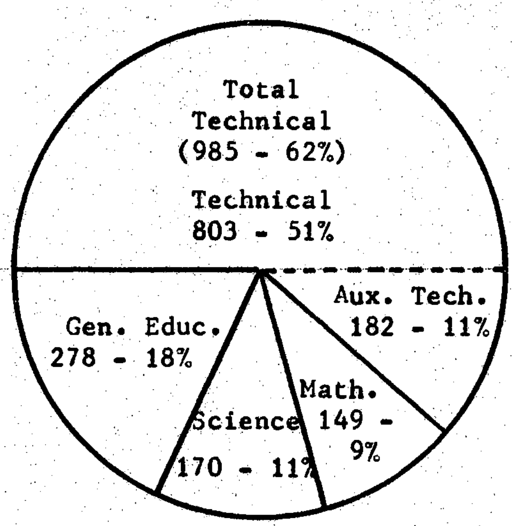


Fig. 2 Distribution of average contact hours in the EMT curriculums studied.

69.9 SEMESTER CREDIT HOURS

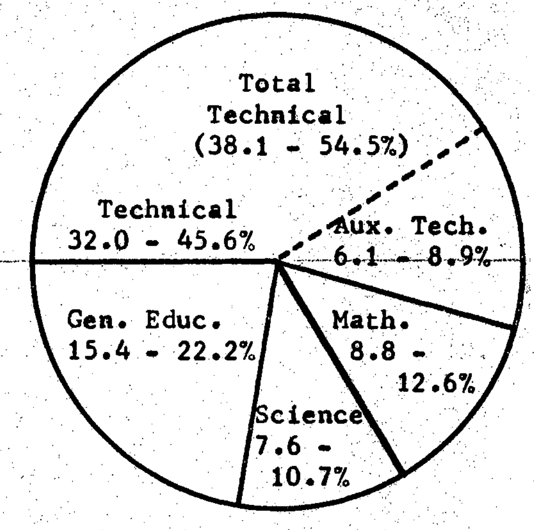


Fig. 3 Distribution of average semester credit hours in the EMT curriculums studied.

The average EMT curriculum had 69.9 semester hours of credit and 1582 contact hours.

The 33 curriculums devote an average of 32 semester hours to the technical specialization, 6.1 semester hours to the auxiliary technical courses, 8.8 hours to mathematics, 7.6 to science, and 15.4 to general education. These quantities, along with the maximum and minimum values observed and the standard deviations, are listed in Table IV.

Table V contains a summary of the percentage of the total credit hours devoted to the five major content groupings. Again, the maximum, minimum, and standard deviation for each grouping is listed.

Table VI lists each of the 33 schools in the TLC analysis. The school having the largest percentage of its curriculum in technical subjects (Oklahoma State University) is listed first, and the school with the least percentage in this category (Chabot College, California) is listed last. Included in this tabulation are the number of 1970 graduates estimated by each school. These estimates were received from the school's registrar or from a person the registrar's office recommended. There were 14 schools reporting no graduates during 1970. The remaining 19 schools estimated they would have a total of 164 graduates of EMT curriculums during 1970. In addition to these graduates, Dunwoody Industrial Institute estimated they would have 19 graduates from their program and Oregon Technical Institute estimated 15 would graduate from their three-year program. In all, the 35 schools having EMT curriculums estimated they will have 198 graduates during 1970. Considering only those schools having graduates during 1970, there were 9.4 students graduating per school.

The percentages listed in Table VI for each of the content areas also include the maximum, minimum, mean, and standard deviation (S.D.) for each category. For example, the average percentage of credit hours devoted to general education is shown to be 22.2 with a S.D. of 7.1 percent. The range in this area is from a low of 11.2 percent at Chesterfield-Marlboro Technical Education Center, South Carolina, to a high of 46.7 percent at Chabot College, California.

Table VII lists the total curriculum hours broken into theory, laboratory and credit hours. Also included are the number of drafting credit hours required by each school. The maximum, minimum, mean, and S.D. are listed for these four sets of values. Table VII tabulates the type of science required, and whether or not

TABLE IV

CREDIT HOUR REQUIREMENTS OF 33 ELECTRO-MECHANICAL TECHNOLOGY CURRICULUMS

Content Area	Credit Hours			
	Max	Min	Mean	S.D.
Technical Courses	45.0	13.3	32.0	6.9
Auxiliary Tech Courses	15.0	1.0	6.1	3.4
Mathematics Courses	13.3	3.0	8.8	2.7
Science Courses	13.3	0.0	7.6	3.0
General Education Courses	28.0	8.0	15.4	4.3
Total Courses	83.3	60.0	69.9	5.5

TABLE V

PERCENTAGE OF TOTAL CREDIT HOURS OF 33 ELECTRO-MECHANICAL TECHNOLOGY CURRICULUMS

Content Area	PERCENTAGE OF CREDIT HOURS			
	Max	Min	Mean	S.D.
Technical Courses	65.2	22.2	45.6	8.4
Auxiliary Tech Courses	24.2	1.3	8.9	5.3
Mathematics	17.7	4.3	12.6	3.5
Science	17.1	0.0	10.7	4.0
General Education	46.7	11.2	22.2	7.1
			100.0	

calculus, physical education, or computer technology are parts of the school's curriculum. The total numbers are given in Table VII and can be summarized in percentage form as follows:

1. Science Requirements - 75.8 percent require only physics, 18.2 percent require both physics and chemistry, and 6 percent require no science.
2. Calculus - 81.8 percent require calculus and 18.2 percent do not require calculus.
3. Physical Education - 35.4 percent require physical education and 63.6 percent have no such requirement.
4. Computer Emphasis - 27.3 percent emphasize computer technology and 72.7 percent do not emphasize computers.

Table VIII lists the TLC hour totals for each school in the different technical areas - technical, auxiliary technical, and total technical. The maximum, minimum, mean, and S.D. for each of these nine sets of values are contained in the table. For example, the total laboratory hours in technical courses for East Los Angeles is 9.0 and for Utah Technical Center it is 50.0. Multiplying these values by 16 gives the total laboratory contact hours - 144 hours and 800 hours of technical laboratory activity, respectively.

Table IX contains the TLC hours for each school in the non-technical categories; namely, mathematics, science, and general education. In each case, the maximum, minimum, mean, and S.D. are listed. The laboratory hours listed under general education are, in every case, physical education activities.

TABLE VI - ELECTROMECHANICAL CURRICULUM SURVEY
PERCENTAGE OF CREDIT HOURS
AND NUMBER OF GRADUATES

School	1970 Grads	Technical	Aux. Tech	Total Tech	Math	Science	General Education
Oklahoma State U, Okla	17	65.2	1.5	66.7	11.6	8.7	13.0
Washtenaw Comm C, Mich	0	61.3	17.7	79.0	6.5	0.0	14.5
Milwaukee Tech C, Wisc	0	60.0	1.3	61.3	8.0	10.7	10.0
North Shore Comm C, Mass	10	53.7	6.0	59.7	11.9	6.0	22.4
New York City Comm C, NY	9	53.4	4.1	57.5	11.0	11.0	20.5
San Antonio C, Texas	0	52.2	8.7	60.9	17.4	8.7	13.0
Chesterfield-Marl TEC, SC	0	52.0	4.8	56.8	16.0	16.0	11.2
Southern Tech I, Ga	5	51.0	5.9	56.9	14.7	16.6	11.8
Catawba Valley TI, NC	3	48.2	6.3	54.5	13.4	10.7	21.4
Utah TC, Salt Lake City	0	48.2	7.0	55.2	15.8	15.8	13.2
Harrisburg Comm C, Pa	0	47.8	7.5	55.3	11.9	5.9	26.9
Arapahoe JC, Colo	0	47.2	8.4	55.6	11.1	11.1	22.2
Lower Columbia C, Wash	0	46.7	16.2	62.9	11.4	8.6	17.1
Blue Hills Tech I, Mass	0	46.5	7.0	53.5	14.1	11.2	21.1
San Bernardino C, Cal	5	45.9	6.8	52.7	8.1	10.8	28.4
Spring Garden I, Pa	5	45.8	1.9	47.7	14.9	11.2	26.2
Vermont Tech C, Vt	9	45.8	9.7	55.5	12.5	11.2	20.8
Phoenix C, Ariz	0	45.7	7.2	52.9	4.3	17.1	25.7
Norwalk State TC, Conn	10	45.6	8.0	53.6	16.0	16.0	14.4

TABLE VI - Continued

School	1970 Grads	Technical	Aux. Tech	Total Tech	Math	Science	General Education
Mercer County Comm C, NJ	6	45.1	9.8	54.9	14.1	11.3	19.7
Ward Tech I, Conn	20	44.4	2.8	47.2	16.7	11.1	25.0
Danville Comm C, Va	0	44.4	7.4	51.8	16.7	11.1	20.4
Union County TI, NJ	0	43.2	10.0	53.2	14.4	10.8	21.6
E. Los Angeles C, Cal	2	42.0	14.5	56.5	17.7	4.8	21.0
Mt. Wachusett Comm, Mass	12	41.0	11.5	52.5	9.8	9.8	27.8
City C San Francisco, Cal	2	40.6	12.5	53.1	7.8	14.1	25.0
Camden County C, NJ	0	40.0	5.7	45.7	17.2	11.4	25.7
Long Beach City C, Cal	15	38.7	24.4	62.9	11.3	0.0	25.8
Massasoit Comm C, Mass	6	37.9	6.1	44.0	12.1	12.1	31.8
New Maxico State U, NM	2	35.7	20.0	55.7	12.9	11.4	20.0
Los Angeles Harbor C, Cal	0	34.8	7.6	42.4	15.2	12.1	30.3
Bristol Comm C, Mass	18	31.9	15.9	47.8	11.6	11.6	29.0
Chabot C, Cal	8	22.2	11.1	33.3	6.7	13.3	46.7
SUMMARY: (n = 33)	164						
Maximum	20	65.2	24.2	79.0	17.7	17.1	46.7
Minimum	0	22.2	1.3	33.3	4.3	0.0	11.2
Mean	5.0	45.6	8.9	54.5	12.6	10.7	22.2
Standard Deviation	6.0	8.4	5.3	7.9	3.5	4.0	7.1

TABLE VII - ELECTROMECHANICAL CURRICULUM SURVEY

OVERALL COMPARISON

School	Total Hours+			Drafting		Physical	Computer	Type
	T	L	C	Hours	Calculus	Education	Emphasis	Science*
Oklahoma State U, Okla	48.0	51.0	69.0	0.0	Yes	No	No	P
Washtenaw Comm C, Mich	38.0	51.0	62.0	6.0	No	No	No	None
Milwaukee Tech C, Wisc	52.0	51.0	75.0	0.0	Yes	No	No	P
North Shore Comm, Mass	55.0	24.0	67.0	4.0	No	No	No	P
New York City Comm, NY	62.0	32.0	73.0	2.0	Yes	No	Yes	P
San Antonio C, Texas	58.0	41.0	69.0	0.0	Yes	No	Yes	P
Chesterfield-Marl, SC	68.0	46.0	83.3	2.0	Yes	No	No	P + Ch
Southern Tech I, Ga	58.0	30.0	68.0	1.3	Yes	No	Yes	P
Catawba Valley TI, NC	58.7	42.0	74.7	2.7	Yes	No	No	P
Utah TC, Salt Lake City	53.3	62.7	76.0	2.0	Yes	No	No	P
Harrisburg Comm C, Pa	57.0	33.0	67.0	2.0	Yes	No	Yes	P
Araphahoe JC, Colo	49.3	62.0	72.0	6.0	Yes	Yes	No	P
Lower Columbia C, Wash	46.7	46.7	70.0	7.3	Yes	Yes	No	P
Blue Hills TI, Mass	61.0	45.0	71.0	2.0	Yes	No	No	P
San Bernardino C, Cal	54.0	65.0	74.0	2.0	Yes	No	No	P
Spring Garden I, Pa	60.7	24.0	71.3	1.3	Yes	No	Yes	P
Vermont Tech C, Vt	54.0	58.0	72.0	4.0	Yes	Yes	No	P
Phoenix C, Ariz	52.0	50.0	70.0	2.0	Yes	Yes	Yes	P
Norwalk State TC, Conn	66.0	42.7	83.3	2.0	Yes	No	No	P + Ch
Mercer County Comm, NJ	56.0	45.0	71.0	4.0	Yes	No	No	P + Ch

TABLE VII – Continued

School	Total Hours+ T	L	C	Drafting Hours	Calculus	Physical Education	Computer Emphasis	Type Science*
Ward Tech I, Conn	61.0	30.0	72.0	2.0	Yes	No	Yes	P
Canville Comm C, Va	57.3	45.3	72.0	4.0	No	Yes	No	P
Union County TI, NJ	58.7	55.3	74.0	1.3	Yes	No	Yes	P
E. Los Angeles C, Cal	54.0	28.0	62.0	5.0	Yes	Yes	No	P
Mt. Wachusetts Comm, Mass	49.0	32.0	61.0	4.0	Yes	No	No	P
City C San Francisco, Cal	45.0	76.0	64.0	7.0	No	Yes	No	P + Ch
Camden County C, NJ	49.0	42.0	70.0	3.0	Yes	Yes	No	P
Long Beach City C, Cal	42.0	58.0	62.0	9.0	No	Yes	No	None
Massasoit Comm C, Mass	56.0	24.0	66.0	4.0	Yes	No	No	P
N. M. State U. NM	55.0	43.0	70.0	11.0	Yes	No	No	P + Ch
Los Angeles Harbot C,	51.0	45.0	66.0	4.0	Yes	Yes	No	P + Ch
Bristol Comm C, Mass	58.0	39.0	69.0	8.0	Yes	No	Yes	P
Chabot C, Cal	46.0	44.7	60.0	5.3	No	Yes	No	P
SUMMARY: (n = 33)								
Maximum	68.0	76.0	83.3	11.0	27-Yes	12-Yes	9-Yes	25-P
Minimum	38.0	24.0	60.0	0.0	6-No	21-No	24-No	6-P + Ch
Mean	54.2	44.7	69.9	3.6				
Standard Deviation	6.6	12.7	5.5	2.6				

+ T-Theory; L-Laboratory; and C-Semester Hours Credit

* P is Physics and Ch is Chemistry

TABLE VIII - ELECTROMECHANICAL CURRICULUM SURVEY

TECHNICAL COMPARISON

School	Technical			Auxiliary Technical			Total Technical		
	T	L	C	T	L	C	T	L	C
Oklahoma State U, Okla	24.0	47.0	45.0	1.0	0.0	1.0	25.0	47.0	46.0
Washtenaw Comm C, Mich	18.0	42.0	38.0	5.0	11.0	11.0	23.0	53.0	49.0
Milwaukee Tech C, Wisc	24.0	47.0	45.0	1.0	0.0	1.0	25.0	47.0	46.0
North Shore Comm C, Mass	28.0	18.0	36.0	1.0	4.0	4.0	30.0	22.0	40.0
New York City Comm C, NY	31.0	22.0	39.0	1.0	6.0	3.0	32.0	28.0	42.0
San Antonio C, Texas	25.0	33.0	36.0	6.0	0.0	6.0	31.0	33.0	42.0
Chesterfield-Marl TEC, SC	33.3	30.0	43.3	2.0	6.0	4.0	35.3	36.0	47.3
Southern Tech I, Ga	28.0	20.0	34.6	2.0	6.0	4.0	30.0	26.0	38.6
Catawba Valley TI, NC	23.3	34.0	36.0	3.3	4.0	4.7	26.7	38.0	40.7
Utah Tc, Salt Lake City	21.3	50.0	36.7	4.7	2.0	5.3	26.0	52.0	42.0
Harrisburg Comm C, Pa	25.0	24.0	32.0	3.0	6.0	5.0	28.0	30.0	37.0
Arapahoe JC, Colo	22.0	34.7	34.0	0.0	18.0	6.0	22.0	52.7	40.0
Lower Columbia C, Wash	18.7	20.7	32.7	2.0	22.0	11.3	20.7	42.7	44.0
Blue Hills Tech I, Mass	25.0	35.0	33.0	4.0	4.0	5.0	29.0	39.0	38.0
San Bernardino C, Cal	21.0	33.0	34.0	1.0	12.0	5.0	22.0	45.0	39.0
Spring Garden I, Pa	25.3	16.0	32.7	0.0	4.0	1.3	25.3	20.0	34.0
Vermont Tech C, Vt	22.0	33.0	33.0	2.0	15.0	7.0	24.0	48.0	40.0
Phoenix C, Ariz	23.0	27.0	32.0	3.0	6.0	5.0	26.0	33.0	37.0
Norwalk State TC, Conn	28.0	26.7	38.0	3.3	8.0	6.7	31.3	35.7	44.7
Mercer County Comm C, NJ	22.0	30.0	32.0	4.0	9.0	7.0	26.0	39.0	39.0

TABLE VIII - Continued

School	Technical T	Technical L	Technical C	Auxiliary Technical T	Auxiliary Technical L	Auxiliary Technical C	Total Technical T	Total Technical L	Total Technical C
Ward Tech I, Conn	24.0	24.0	32.0	1.0	2.0	2.0	25.0	26.0	34.0
Canville Comm C, Va	24.7	23.3	32.0	2.7	8.0	5.3	27.3	31.3	37.3
Union County TI, NJ	19.3	47.3	32.0	6.7	2.0	7.3	26.0	49.3	35.0
E. Los Angeles C, Cal	23.0	9.0	26.0	5.0	11.0	9.0	28.0	20.0	35.0
Mt. Wachusett Comm, Mass	19.0	18.0	25.0	3.0	8.0	7.0	22.0	26.0	32.0
City C San Francisco, Cal	15.0	39.0	26.0	3.0	19.0	8.0	18.0	58.0	34.0
Camden County C, NJ	16.0	24.0	28.0	2.0	4.0	4.0	18.0	28.0	32.0
Long Beach City C, Cal	14.0	28.0	24.0	7.0	22.0	15.0	21.0	50.0	39.0
Massasoit Comm C, Mass	21.0	12.0	25.0	0.0	8.0	4.0	21.0	20.0	29.0
New Mexico State U, NM	17.0	24.0	25.0	8.0	16.0	14.0	25.0	40.0	39.0
Los Angeles Harbor C, Cal	13.0	28.0	23.0	4.0	3.0	5.0	17.0	31.0	28.0
Bristol Comm C, Mass	15.0	21.0	22.0	9.0	12.0	11.0	24.0	33.0	33.0
Chabot C, Cal	7.7	17.0	13.3	2.0	14.0	6.7	9.7	31.0	20.0
Summary: (n = 33)									
Maximum	33.3	50.0	45.0	9.0	22.0	15.0	35.3	58.0	49.0
Minimum	7.7	9.0	13.3	0.0	0.0	1.0	9.7	20.0	20.0
Mean	21.7	28.4	32.0	3.1	8.2	6.1	24.9	36.7	38.1
Standard Deviation	5.4	10.4	6.9	2.3	6.2	3.4	5.0	10.8	6.0

TABLE IX - ELECTROMECHANICAL CURRICULUM SURVEY

NON-TECHNICAL COMPARISON

School	Mathematics			Science			General Education		
	T	L	C	T	L	C	T	L	C
Oklahoma State U, Okla	8.0	0.0	8.0	6.0	4.0	6.0	9.0	0.0	9.0
Washtenaw Comm C, Mich	4.0	0.0	4.0	0.0	0.0	0.0	9.0	0.0	9.0
Milwaukee Tech C, Wisc	6.0	0.0	6.0	6.0	4.0	8.0	15.0	0.0	15.0
North Shore Comm C, Mass	8.0	0.0	8.0	2.0	2.0	4.0	15.0	0.0	15.0
New York City Comm C, NY	8.0	0.0	8.0	6.0	4.0	8.0	16.0	0.0	15.0
San Antonio C, Texas	12.0	4.0	12.0	6.0	4.0	6.0	9.0	0.0	9.0
Chesterfield-Marl TEC, SC	13.3	0.0	13.3	10.0	10.0	13.3	9.3	0.0	9.3
Southern Tech I, Ga	10.0	0.0	10.0	10.0	4.0	11.3	8.0	0.0	8.0
Catawba Valley TI, NC	10.0	0.0	10.0	6.0	4.0	8.0	16.0	0.0	16.0
Utah TC, Salt Lake City	12.0	6.7	12.0	12.0	4.0	12.0	10.0	0.0	10.0
Harrisburg Comm C, Pa	8.0	0.0	8.0	3.0	3.0	4.0	18.0	0.0	18.0
Arapahoe JC, Colo	8.0	0.0	8.0	5.3	5.3	8.0	14.0	4.0	16.0
Lower Columbia C, Wash	8.0	0.0	8.0	6.0	4.0	6.0	12.0	0.0	12.0
Blue Hills Tech I, Mass	11.0	0.0	10.0	6.0	6.0	8.0	15.0	0.0	15.0
San Bernardino C, Cal	6.0	0.0	6.0	8.0	0.0	8.0	18.0	20.0	21.0
Spring Garden I, Pa	10.7	0.0	10.7	6.0	4.0	8.0	18.7	0.0	18.7
Vermont Tech C, Vt	9.0	0.0	9.0	6.0	6.0	8.0	15.0	4.0	15.0
Phoenix C, Ariz	3.0	0.0	3.0	9.0	9.0	12.0	14.0	8.0	18.0
Norwalk State TC, Conn	12.7	1.3	13.3	10.0	6.7	13.3	12.0	0.0	12.0
Mercer County Comm C, NJ	10.0	0.0	10.0	6.0	6.0	8.0	14.0	0.0	14.0

TABLE IX - Continued

School	Mathematics T	Mathematics L	Mathematics C	Science T	Science L	Science C	General Education T	General Education L	General Education C
Ward Tech I, Conn	12.0	0.0	12.0	6.0	4.0	8.0	18.0	0.0	18.0
Danville Comm C, Va	12.0	0.0	12.0	6.0	6.0	8.0	12.0	8.0	14.7
Union County TI, NJ	10.7	0.0	10.7	6.0	6.0	8.0	16.0	0.0	16.0
E. Los Angeles C, Cal	12.0	0.0	11.0	3.0	0.0	3.0	11.0	8.0	13.0
Mt. Wachusett Comm, Mass	6.0	0.0	6.0	4.0	6.0	6.0	17.0	0.0	17.0
City C San Francisco, Cal	6.0	0.0	5.0	6.0	10.0	9.0	15.0	8.0	16.0
Camden County C, NJ	12.0	0.0	12.0	4.0	8.0	8.0	15.0	6.0	18.0
Long Beach City C, Cal	7.0	0.0	7.0	0.0	0.0	0.0	14.0	8.0	16.0
Massasoit Comm C, Mass	8.0	0.0	8.0	6.0	4.0	8.0	21.0	0.0	21.0
New Mexico State U, NM	9.0	0.0	9.0	7.0	3.0	8.0	14.0	0.0	14.0
Los Angeles Harbor C, Cal	10.0	0.0	10.0	6.0	6.0	8.0	18.0	8.0	20.0
Bristol Comm C, Mass	8.0	0.0	8.0	6.0	6.0	8.0	20.0	0.0	20.0
Chabot C, Cal	4.7	0.0	4.0	6.0	6.0	8.0	26.0	8.0	28.0
Summary: (n = 33)									
Maximum	13.3	6.7	13.3	12.0	10.0	13.3	26.0	20.0	28.0
Minimum	3.0	0.0	3.0	0.0	0.0	0.0	8.0	0.0	8.0
Mean	8.9	0.4	8.8	5.9	4.7	7.6	14.7	2.7	15.4
Standard Deviation	2.7	1.3	2.7	2.6	2.6	3.0	3.9	4.6	4.3

Community/Junior College Survey

The schools listed in the sample of 95 in Appendix B were sent a letter asking that one of four opinions relating to EMT offerings and curriculums be chosen as representative of the school's practices in this specialty area. The results of this survey are contained in Table X.

TABLE X

SURVEY OF EMT OFFERINGS IN JUNIOR COLLEGES

Code	Option	No.	Percentage
1	Separate EMT Curriculum	4	4.2
2	EMT Option to a Curriculum	1	1.0
3	EMT Courses Only	28	29.5
4	No EMT Curriculum/Courses	52	54.8
0	No Reply to Letter	10	10.8

Based upon the results of this survey, approximately 5 percent of the community/junior colleges of the nation have a curriculum in electro-mechanical technology. Only one of the five schools responding as having a separate curriculum or an option to an existing curriculum, was not already on the list used in the study. The school added as the result of this survey was San Antonio College.

Comparison of OSU Curriculum Content to the National Averages

Table XI contains the national averages for the various curriculum content areas and the respective standard deviations. Also contained in Table VI is the OSU EMT curriculum content for the various listings. From these three quantities, the number of standard deviations from the mean (Z-score) is determined and listed.

TABLE XI

COMPARISON OF OSU EMT CURRICULUM CONTENT
WITH NATIONAL AVERAGES

Variable	Nat'l Average	Nat'l S.D.	OSU EMT Value	Z-score
Theory Hours				
Technical	21.7	5.4	24.0	+0.43
Auxiliary Technical	3.1	2.3	1.0	-0.91
Total Technical	24.9	5.0	25.0	+0.02
Mathematics	8.9	2.7	8.0	-0.33
Science	5.9	2.6	6.0	+0.04
General Education	14.7	3.9	9.0	-1.46*
Total Theory Hours	54.2	6.6	48.0	-0.94
Laboratory Hours				
Technical	28.4	10.4	47.0	+1.79*
Auxiliary Technical	8.2	6.2	0.0	-1.32*
Total Technical	36.7	10.8	47.0	+0.95
Mathematics	0.4	1.3	0.0	-0.31
Science	4.7	2.6	4.0	-0.27
General Education	2.7	4.6	0.0	-0.59
Total Lab Hours	44.7	12.7	51.0	+0.50
Credit Hours				
Technical	32.0	6.9	45.0	+1.88*
Auxiliary Technical	6.1	3.4	1.0	-1.50*
Total Technical	38.1	6.0	46.0	+1.32*
Mathematics	8.8	2.7	8.0	-0.30
Science	7.6	3.0	6.0	-0.53
General Education	15.4	4.3	9.0	-1.49*
Total Credit Hours	69.9	5.5	69.0	-0.02
Drafting Hours	3.6	2.6	0.0	-1.38*
Number of Graduates (n + 33)	5.0	6.0	17.0	+2.00**
Number of Graduates (n + 21)	9.4	5.9	17.0	+1.29*
Percentages				
Technical	45.6	8.4	65.2	+2.33**
Auxiliary Technical	8.9	5.3	1.5	-1.40*
Total Technical	54.5	7.9	66.7	+1.54*
Mathematics	12.6	3.5	11.6	-0.29
Science	10.7	4.0	8.7	-0.50
General Education	22.2	7.1	13.0	-1.30*

* OSU EMT between 1.0 and 2.0 S.D. from Nat'l average.
** OSU EMT 2.0 S.D. or more from Nat'l average.

All of the theory hours are within one S.D. of the national mean with the exception of the general education area. The OSU EMT curriculum is 1.46 S.D. low in general education classroom activity.

The laboratory hours in the technical specialty courses are 1.79 S.D. higher than the national average. At the same time, the auxiliary technical laboratory hours are 1.32 s.d. low. Most of the auxiliary technical courses consist of drafting. This area is not taught separately in the OSU curriculum. The increase in laboratory hours is expected since the philosophy underlying the design of the OSU curriculum emphasizes this area.

The credit hours Z-scores show that there is 1.32 S.D. more technical credit hours in the OSU EMT curriculum than in the national average. This comes at the expense of the general education credit hours, where there is 1.49 S.D. less credit. This same information is contained in the analysis of the percentages where the technical percentage shows being over the 2 S.D. level.

A chi-square analysis of the five content groupings and of their theory, laboratory, and credit hour distribution was made and is shown in Table XII. This analysis is a test for goodness-of-fit; that is, to determine whether the OSU EMT curriculum has the same form as that of the national averages.

From Table XII, it can be seen that the distributions of credit hours and laboratory hours differ significantly from the national average. In both cases, the chi-square value exceeds the tabular value required for significance at the 0.05 level. The largest chi-square values in the credit hour tabulation comes from the large difference between the OSU technical hours, the

TABLE XII

CHI-SQUARE ANALYSIS OF NATIONAL AVERAGES AND OSU EMT VALUES

Variable	O_i	E_i	d	d^2	d^2/E_i
Credit Hours	(OSU)	(Ntl)	(O-E)		X^2
Technical	45.0	32.0	+13.0	169.00	5.28
Auxiliary Technical	1.0	6.1	-5.1	26.01	4.26
Mathematics	8.0	8.8	-0.8	0.64	0.07
Science	6.0	7.6	-1.6	2.56	0.34
General Education	9.0	15.4	-6.4	40.96	2.66
Totals (for df = 4, $chi^2_{.05}$ = 9.49					12.61*
Theory Hours					
Technical	24.0	21.7	+2.3	5.29	0.24
Auxiliary Technical	1.0	3.1	-2.1	4.41	1.42
Mathematics	8.0	8.9	-0.9	0.81	0.09
Science	6.0	5.9	+0.1	0.01	0.00
General Education	9.0	14.7	-5.7	32.49	2.21
Totals (for df = 4, $chi^2_{.05}$ = 9.49)					3.96
Laboratory Hours					
Technical	47.0	28.4	+18.6	345.96	12.18
Auxiliary Technical	0.0	8.2	-8.2	67.24	8.20
Mathematics	0.0	0.4	-0.4	0.16	0.40
Science	4.0	4.7	-0.7	0.49	0.10
General Education	0.0	2.7	-2.7	7.29	2.70
Totals (for df - 4, $chi^2_{.05}$ = 9.49					23.58*
Total Hours					
Theory Hours	48.0	54.2	-10.2	104.04	1.92
Laboratory Hours	51.0	44.7	+6.3	39.69	0.89
Credit Hours	69.0	69.9	-0.9	0.81	0.01
Totals (for df = 2, $chi^2_{.05}$ = 5.99)					2.82

* OSU chi^2 exceeds nat'l average value.

corresponding lesser number of general education hours, and the lack of drafting hours. In the laboratory hours tabulation, the one difference that causes rejection in and of itself, is the significantly larger amount of laboratory time.

The chi-square analysis shows no significant difference in the distribution of theory hours nor in the distribution of total hours in the three subdivisions of theory, laboratory or credit.

OSU EMT Graduate Employability

The qualifying examinations of three major industries were administered to the OSU EMT curriculum graduates in May, 1970. The raw scores achieved by the OSU EMT graduates on the five tests administered are shown in Table XIII. Although not used in this particular part of the study, the mean score and the standard deviation for each set of test scores is given in Table XIII. Below each set of scores are listed the minimum pass point and the preferred score desired by the particular industry.

The scores made by the OSU EMT graduates on the industrial qualifying examinations gave the following information.

1. Research and development industry:

   7 (41.2 percent) qualified; of these,

   5 (29.4 percent) were at the preferred level; and

   10 (58.8 percent) failed to qualify.

2. Component manufacturing industry:

   12 (70.6 percent) qualified; of these,

   8 (47.1 percent) were at the preferred level; and

   5 (29.4 percent) failed to qualify.

TABLE XIII

RAW SCORES ON INDUSTRIAL QUALIFYING EXAMINATIONS MADE BY OSU GRADUATES

Student No.	R & D Tech	Manufacturing Tech	Tech	Computer Aptitude	Computer Mechanical
1	61++	87++	37+	47++	26+
2	53++	72++	33+	30	23+
3	49++	54+	29+	43++	34+
4	50++	74++	30+	34	32+
5	46++	41	31+	48++	28+
6	45+	55++	32+	47++	31+
7	42+	63++	27+	39+	26+
8	39	64++	27+	38+	23+
9	37	55++	23	50++	16
10	36	58++	33+	49++	32+
11	35	36	19	33	22+
12	32	50+	24	41++	31+
13	32	42+	24	34	23+
14	32	37	12	20	13
15	29	39	22	21	26+
16	28	40	16	29	28+
17	26	46+	24	40++	28+
Mean	39.53	53.71	26.06	37.82	26.00
S.D.	9.86	14.66	6.56	9.29	5.65
Minimum Pass Point	41	42	25	35	19
Preferred Score	46	55	-	40	-

++ Indicates score above preferred score, where applicable.

\+ Indicates score above minimum pass point.

3. Business machines and computer industry:

On the technical test -

9 (52.9 percent) qualified; and

8 (47.1 percent) failed to qualify.

On the aptitude test -

10 (58.8 percent) qualified; of these,

8 (47.1 percent) were at the preferred level; and

7 (41.2 percent) failed to qualify.

On the mechanical test -

15 (88.2 percent) qualified; and

2 (11.8 percent) failed to qualify.

Overall, using two qualifying scores as the success criteria,

11 (64.7 percent) qualified; and

6 (35.3 percent) failed to qualify.

The overall results indicate the following:

6 graduates (35.3 percent) qualified, on all three examinations;

5 graduates (29.4 percent) qualified on two of the three;

2 graduates (11.8 percent) qualified on only one examination; and

4 graduates (23.5 percent) failed to qualify on any examination.

Comparison of OSU EMT Graduates and Industry Populations

The raw scores on the industrial examinations achieved by the OSU EMT graduates are contained in Table XIII. Before comparing the

TABLE XIV

RANK ORDER OF SCORES MADE ON INDUSTRIAL EXAMINATIONS BY OSU EMT GRADUATES AND THE RESULTING RANK ORDER CORRELATION COEFFICIENTS

Student No.	R & D Tech	Manufacturing Tech	Computer Tech	Computer Aptitude	Computer Mechanical
1	1	1	1	4	9
2	2	3	2	14	12
3	4	9	7	6	1
4	3	2	6	11	2
5	5	13	5	3	6
6	6	7	4	4	4
7	7	5	8	9	9
8	8	4	8	10	12
9	9	7	13	1	16
10	10	6	2	2	2
11	11	17	15	13	15
12	12	10	10	7	4
13	12	12	10	11	12
14	12	16	17	17	17
15	15	15	14	16	9
16	16	14	16	15	6
17	17	11	10	8	6

Correlation Coefficient					
R & D - Tech	1.000	.721**	.752**	.383	.174
Mgf-Tech		1.000	.772**	.423*	.308
Cmptr-Tech			1.000	.516*	.480*
Comptr-Ampt				1.000	.362*

** Significant at the 0.01 level
* Significant at the 0.05 level

OSU EMT graduates with the industrial comparison populations, a correlation study of the industrial tests was made. The raw scores in Table XIII were converted into the rank orders in Table XIV.

Computation of the Spearman Rank Correlation Coefficient (42, p. 69) results in the data at the bottom of Table XIV. The critical value of the coefficient at the 0.05 level is 0.412; and at the 0.01 level is 0.583. Examination of the correlations in Table XIV shows that the technical tests are significantly correlated at the 0.01 level. The computer industry's technical test correlates significantly at the 0.05 level with the aptitude and with the mechanical test. The manufacturing industry's technical test is significantly correlated with the computer industry's aptitude test at the 0.05 level. The other combinations of test pairings are not significantly correlated at these levels.

Using the t-test techniques discussed in Chapter III, the null hypothesis was tested that there was no significant difference between the mean score made by the OSU EMT graduates and the mean score made by the industrial comparison population. This null hypothesis was tested for each of the five industrial tests at the 0.05 level. The critical value of t at the 0.05 level was 1.96. The results of the computation of t-scores are shown in Table XV.

The largest t-score obtained when comparing the OSU EMT graduates' scores with the scores made by the industrial comparison populations, was 1.847. This score is less than the value of t at the 0.05 level, and, thus, the null hypothesis is not rejected. The difference between the means of the two populations was not significant. In this case, the comparison population consists of electronics technology graduates. In fact, an entire graduating class of single specialty technicians was used.

TABLE XV - COMPARISON OF POPULATION MEANS

Industrial Test	Population	Mean	S.D.	N	t-score
R & D-Technical	Comparison	44.00	3.50	100	
	OSU EMT	39.53	9.86	17	1.847
Manufacturing-Technical	Comparison	57.60	8.49	227	
	OSU EMT	53.61	14.66	17	1.080
Computer-Technical	Comparison	27.36	4.80	154	
	OSU EMT	26.06	6.56	17	0.794
Computer-Aptitude	Comparison	41.02	6.70	162	
	OSU EMT	37.82	9.29	17	1.383
Computer-Mechanical	Comparison	27.20	5.01	162	
	OSU EMT	26.00	5.65	17	0.756

The other t-scores contained in Table XV are smaller than the R & D technical value when compared to the OSU EMT graduates. In no case could the null hypothesis be rejected. There were no significant differences (at the 0.05 level) between the means.

The OSU EMT graduates had taken the three tests comprising the business machine and computer industry qualifying examination approximately one month before they were administered for this study. Since all individuals of the comparison population had also taken these tests earlier, it was not felt that any great harm had been done. However, it was decided to compare the differences between the first and second time results to determine if improvement had occured. If the computed t-score exceeds the critical value (0.05 level), then the null hypothesis could be rejected. A detailed discussion of the statistic utilized is in Chapter III. The raw scores and the differences are itemized in Table XVI.

In every case, the t-score computed from the data given in Table XVI are larger than the value of t at the 0.05 level. Thus, the null hypothesis must be rejected. It can be assumed that the graduates did improve their scores upon the second administering of each of these three tests.

A chi-square analysis was performed using the scores made by the students applying for employment with the manufacturing industry as the expected values. Although the OSU averages were lower in every grouping, the differences between these two populations when considered by grade groupings was not significant at the 0.05 level.

TABLE XVI

TEST OF DIFFERENCES BETWEEN TWO MEASURES ON THREE TESTS

Computer-Technical			Computer-Aptitude			Computer-Mechanical		
Second Taking	First Taking	D	Second Taking	First Taking	D	Second Taking	First Taking	D
37	31	+6	47	47	0	26	20	+6
33	27	+6	30	31	-1	23	29	-6
29	30	-1	43	42	+1	34	31	+3
30	22	+8	34	25	+9	32	20	+12
31	21	+10	48	40	+8	28	25	+3
32	14	+18	47	38	+9	31	29	+2
27	22	+5	38	33	+5	23	23	0
23	24	-1	50	48	+8	16	20	-4
33	35	-2	49	40	+9	32	23	+9
19	20	-1	33	30	+3	22	19	+3
24	18	+6	41	31	+10	31	25	+6
24	19	+5	34	37	-3	23	14	+9
22	16	+6	21	28	-7	26	20	+6
16	15	+1	29	30	-1	28	--	--
24	23	+1	40	40	0	28	26	+2
Sum of D = +70			Sum of D = +53			Sum of D = +54		
Sum of D^2 = 612			Sum of D^2 = 575			Sum of D^2 = 510		
N = 16			N = 16			N = 15		
t-score 3.88			t = 2.57			t = 2.94		
* ($t_{.05}$ = 2.13)			($t_{.05}$ = 2.13)			($t_{.05}$ = 2.15)		

* $t_{.05}$ is the value of t at the 0.05 significance level.

TABLE XVII

CHI-SQUARE ANALYSIS OF OSU EMT GRADUATES AND MANUFACTURING INDUSTRY REFERENCE POPULATION

	OSU AVERAGE	INDUSTRY AVERAGE
A - Students	75.5	77
B - Students	53.2	67
C - Students	52.5	55
D - Students	38.7	42

df = 3, $Chi^2_{0.05} = 7.82$ $chi^2 = 3.24$

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The problem with which this study was concerned was whether or not the curriculum in electro-mechanical technology developed at Oklahoma State University differed significantly from that offered by other schools in the nation. And whether the first graduates of the curriculum could be considered employable by various selected industries.

Summary

The purpose of the study was to evaluate the curriculum in electro-mechanical technology at Oklahoma State University. Emphasis was placed upon the comparison of the OSU EMT curriculum with practices of other schools that offer EMT curriculums. The performance of the first OSU EMT graduates on selected industrial qualifying examinations was also examined. These purposes were pursued in the following manner:

a. The content of electro-mechanical technology curriculums was examined, summarized, and analyzed.

b. The content of the EMT curriculum developed at OSU was compared with that of other schools.

c. Qualifying examinations of three industries were used to determine the probable employability of the OSU EMT graduates.

The first step in the study was to contact schools thought to offer EMT courses or an EMT curriculum. Detailed information regarding these curriculums was requested. Of the 105 schools contacted, 35 were found to have two or three year EMT curriculums.

To assure that large numbers of schools were not being omitted, a random survey was made of the 992 schools listed by the American Association of Junior Colleges. The results of this survey indicated that about five percent of these schools may offer EMT curriculums.

Of the 35 schools offering electro-mechanical technology, 33 curriculums were subjected to an analysis of theory, laboratory, and credit hours. The curriculum content of each school was subdivided into five subject matter areas: technical, auxiliary technical, mathematics, science, and general education. The number of theory, laboratory, and credit hours in each area was tabulated. Other tabulations were made showing the percentage of credit hours devoted to the five subject matter areas. The hours assigned to drafting courses were indicated for each school. The maximum, minimum, mean, and standard deviation were indicated for each tabulation. A summary of EMT curriculum practices is contained in Table XVIII.

The theory contact hours comprised 54.8 percent and the laboratory contact hours comprised 45.2 percent of the average curriculum. Of the total 1,582 contact hours, 62 percent were devoted to technical and auxiliary technical courses. This was greater than the 54.5 percent of the credit hours alloted to these two areas.

The average percentage of credit hours devoted to the various subject matter areas were:

Technical courses - 45.6 percent;

Auxiliary technical courses - 8.9 percent;

Mathematics - 12.6 percent;

Science - 10.7 percent;

General education - 22.2 percent.

Of the 33 curriculums analyzed, 81.8 percent required mathematics through calculus. Some 75.8 percent of the schools had physics as their only science requirement, 18.2 percent required both physics and chemistry, and 6 percent required no science at all. Over 63 percent of the schools did not require physical education. And 72.7 percent did not emphasize computer engineering technology.

There were 21 schools graduating EMT technicians during 1970. With a total of 198 graduates. The average number of graduates of these schools was 9.4. The average number of graduates per school, if all 35 schools are considered, would be 5.7.

The OSU curriculum content was compared to the average in two ways. First, Z-scores were computed for the different variables and those over one SD from the mean were identified. Second, a chi-square analysis was performed on the five subject matter areas using credit, theory, laboratory, and total hours. In both cases the findings were similar. The chi-square analysis revealed no significant difference in the theory and total hours. However, significant differences between both laboratory and credit hours in the technical area were found.

The variables found to be more than one SD higher than the averages were; technical laboratory hours, technical credit hours, total technical credit hours, and the number of graduates. The variables found to be more than one SD lower than the averages were;

TABLE XVIII

SUMMARY OF NATIONAL EMT CURRICULUM PRACTICES

Variable		Minimum	-1 SD	Mean	+1 SD	Maximum	Range
Total Theory	T	38.0	47.6	54.2	60.8	83.3	23.3
Total Lab	L	24.0	32.0	44.7	57.4	76.0	52.0
Total Credit	C	60.0	64.4	69.9	75.4	83.3	23.3
Technical	T	7.7	16.3	21.7	27.1	33.3	25.6
Technical	L	9.0	18.0	28.4	38.8	50.0	41.0
Technical	C	13.3	25.1	32.0	38.9	45.0	31.7
Auxiliary Tech	T	0.0	0.8	3.1	5.4	9.0	9.0
Auxiliary Tech	L	0.0	2.0	8.2	14.4	22.0	22.0
Auxiliary Tech	C	1.0	2.7	6.1	9.5	15.0	14.0
Mathematics	T	3.0	6.2	8.9	11.6	13.3	10.3
Mathematics	L	0.0	-0.9	0.4	1.7	6.7	6.7
Mathematics	C	3.0	6.1	8.8	11.5	13.3	10.3
Science	T	0.0	3.3	5.9	8.5	12.0	12.0
Science	L	0.0	2.0	4.7	7.3	10.0	10.3
Science	C	0.0	4.6	7.6	10.6	13.3	13.3
Gen. Education	T	8.0	10.8	14.7	18.6	26.0	18.0
Gen. Education	L	0.0	-1.9	2.7	7.3	20.0	20.0
Gen. Education	C	8.0	11.1	15.4	19.7	28.0	20.0
Drafting	C	0.0	1.0	3.6	6.2	11.0	11.0
Students - Number (n = 35)		0.0	-0.9	5.7	12.2	20.0	20.0

general education theory hours, auxiliary technical laboratory hours, auxiliary technical credit hours, general education credit hours, and drafting hours.

These two analyses both show that the OSU EMT curriculum differs from the average by having more technical laboratory and credit hours, and by having less general education. The lack of separate drafting courses in the OSU EMT curriculum causes the auxiliary technical area to be lower than the average. The credit hours in technical courses in the OSU curriculum were 1.32 SD higher than the average and the general education credit hours were 1.49 SD lower than the average.

The industrial qualifying examinations indicated that; 35.3 percent of the graduates qualified on all three examinations, 29.4 percent qualified on two examinations, 11.8 percent qualified on only one examination, and 23.5 percent failed to qualify on any of the examinations.

More students qualified on the manufacturing industry examination than on any other. And fewer students qualified on the research and development industry examination than on any other.

A rank-order analysis showed that the technical tests making up portions of the industrial examinations correlated with each other producing coefficients between 0.174 and 0.772. These correlation coefficients were significant at the 0.05 level or better.

The following hypothesis was tested: No significant difference exists between the means of the graduates and the means of the industrial comparison populations as measured on the industrial qualifying examinations. The five tests used had different comparison populations. A t-score was computed for each test. In every case, the t-score was less than that required for the 0.05 confidence level therefore the null hypothesis was not rejected. This analysis indicated that there was no significant differences between the two groups.

The five populations that the OSU EMT graduates were compared to included; an entire graduating class of electronics technology students from an ECPD approved curriculum, the technical institute (or equivalent) graduates who had applied for employment with one of the cooperating companies in a single year, and three groups of electro-mechanical technicians who had been on their present jobs less than 15 months.

Conclusions

The design of this study included: A broad look at the curriculum practices of schools offering electro-mechanical technology; an examination and comparison of the practices at Oklahoma State University; and an evaluation of the students graduating from the OSU program. The conclusions reached during the study will be presented in inverted order. That is, the conclusions regarding the students will be discussed first and then the conclusions regarding the study of curriculums.

Comparison of OSU Graduates with Industrial Populations

1. No significant differences existed in the electronics knowledge possessed by the OSU EMT graduates and that possessed by the graduates of an ECPD accredited single specialty electronics

curriculum, as measured by a research and development firm's qualifying examination.

2. No significant differences existed in the electronics knowledge possessed by the OSU EMT graduates and that possessed by the graduates of technical curriculums who applied for positions with a modern component manufacturing company, as measured by the firm's qualifying examination.

3. No significant differences existed in the electronics knowledge, the aptitude, or the mechanical knowledge possessed by the OSU EMT graduates and that possessed by recently employed personnel of a large computer firm as measured by that company's qualifying examinations.

4. It was concluded that the OSU EMT graduates possessed electronics knowledge that was not significantly different from that possessed by graduates of single specialty curricula. Moreover, they possessed mechanical knowledge not significantly different from recently hired employees engaged in electro-mechanical activities.

Determining Graduate Employability

5. No rigorous criteria can be applied relating to actual employability. Scores on qualifying examinations are only one of many tools used to determine whether or not a person will be hired by a particular company. The fact that 76.5 percent of the OSU EMT graduates qualified on at least one of the examinations seemed to indicate outstanding performance. The research and development company rarely, for example, expects three or four graduates of a particular school to qualify on their examination.

Nature of the Industrial Qualifying Examination

6. Correlations significant at the 0.01 level existed between the electronics tests given on qualifying examinations of the research and development, the manufacturing, and the computer industries.

7. The mechanical test has low correlation coefficients when compared with the electronics tests. Only one of the three electronics tests being used correlated with the mechanical test with a correlation coefficient as high as 0.45 and then only at the 0.05 level.

Comparison of OSU EMT Curriculum with National Practice

8. The OSU EMT curriculum conained significantly more technical and more laboratory content than was the practice at the other schools surveyed.

9. The OSU EMT curriculum contained significantly less auxiliary technical content than the average.

Survey of Curriculum Practice

10. Based on the replies to the queries made during this study it was concluded that many educational administrators do not differentiate between electronic technology and electro-mechanical technology. Of the schools claiming to offer an EMT curriculum a number responded by submitting their electronics curriculum showing no mechanical content.

11. Questionnaire responses regarding curricular offerings frequently contained errors. In follow-up contacts, it was determined that 53 schools that had claimed to have EMT curriculums, apparently

did not.

12. Differences of opinion existed regarding curriculum content in electro-mechanical technology. Some schools identified this field as computer engineering oriented, while others regarded it to be instrumentation and servo-mechanism oriented. Some considered the appropriate technical level to be quite low while others saw it as relatively high. The majority of the schools offering this specialty appeared to prefer a comparatively high technical level and a fairly broad base of knowledge.

There are schools changing their curriculum name from electro-mechanical technology to computer engineering technology whenever the emphasis was on computers. Telephone conversations during the study revealed that others thought this should be done to minimize confusion.

13. Relatively few schools offered electro-mechanical technology curriculums. The survey indicated that only about five percent of junior colleges offer this much needed program. A conclusion that could be inferred from this is that schools are not responding rapidly to this need. The need has been demonstrated repeatedly since the early 1960's, yet only 21 schools could be found that had EMT graduates during 1970.

14. The number of persons graduating in EMT does not meet the national need. The total number of graduates estimated during 1970 was found to be 198. The need for graduates of this type has been estimated to be from 20,000 to 100,000.

Recommendations

1. It is recommended that more schools offering EMT adopt an approach similar to the OSU program. This study has shown that graduates completing a curriculum of this type were similar to selected industrial populations in their knowledge of electronics and mechanics; more experimentation using this approach is encouraged.

2. It is recommended that a study be conducted which emphasizes instructional methods rather than curriculum content. The stated purpose of the OSU EMT approach was to increase the student's rate of learning by providing adequate reinforcement and assuring transfer of learning from one subject area to another. Other studies could be conducted to ascertain whether or not this approach provides a broader base for continuing educational activity.

3. Much confusion exists regarding the emphasis, level, and content of electro-mechanical technology. It is recommended that this problem be resolved and the results disseminated to educational and industrial organizations. The assistance of concerned professional societies and accrediting groups would be valuable in solving this problem.

4. This study of electro-mechanical technology curriculums revealed a trend toward increasing the proportion of the curriculum alloted to general education. It is recommended that a study be conducted to determine the need for, and the type of, general education offerings in engineering technology curricula.

5. The search for literature pertinent to this study revealed

a lack of texual and other curricular materials relating to electro-mechanical technology. It is recommended that curricular materials be prepared for this specialty, and that schools possessing such materials encourage publishers to disseminate them.

6. It is recommended that schools make increased use of industrial qualifying examinations to evaluate graduate performance. Such an effort would help bring school offerings closer to the needs of industry.

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APPENDIX A

SCHOOLS LISTED AS HAVING ELECTROMECHANICAL OFFERINGS

EASTERN ARIZONA COLLEGE
Thatcher, Arizona 85552

MARICOPA COUNTY JUNIOR COLLEGE DISTRICT
106 E. Washington St.
Phoenix, Arizona 85004

CROWLEY'S RIDGE VOC-TECH SCHOOL (**)
I-40 at New Castle Rd.
Forrest City, Arkansas 72335

BARSTOW COLLEGE
2700 Barstow Rd.
Barstow, California 72311

CHABOT COLLEGE
25555 Hesperian Blvd.
Hayward, California 94545

CITY COLLEGE OF SAN FRANCISCO
San Francisco, California 94112

COLLEGE OF THE REDWOODS
Eureka, California 95501

COLLEGE OF THE SISKIYOUS
800 College Ave.
Weed, California 96094

EAST LOS ANGELES COLLEGE
5357 E. Brooklyn Ave.
Los Angeles, California 90022

GOLDEN WEST COLLEGE
15744 Golden West
Huntington Beach, California 92646

GROSSMONT COLLEGE
8800 Grossmont College Dr.
El Cajon, California 92020

LONG BEACH CITY COLLEGE (**)
4901 E. Carson St.
Long Beach, California 90808

LOS ANGELES HARBOR COLLEGE
1111 Figueroa Pl.
Wilmington, California 90744

LOS ANGELES PIERCE COLLEGE (*)
6201 Winnetka Ave.
Woodland Hills, California

LOS ANGELES TRADE-TECHNICAL COLLEGE (**)
400 W. Washington Blvd.
Los Angeles, California 90015

MERRITT COLLEGE
5714 Grove St.
Oakland, California 94609

SAN BERNARDINO VALLEY COLLEGE OF THE SAN BERNARDINA JUNIOR COLLEGE DISTRICT (**)
701 S. Mt. Vernon Ave.
San Bernardino, California 92324

SHASTA COLLEGE
Old Oregon Trail
Redding, California 96001

SIERRA COLLEGE
5000 Rocklin Rd.
Rocklin, California 95677

VENTURA COLLEGE (*)
4667 Telegraph Rd.
Ventura, California 93003

ARAPAHOE JUNIOR COLLEGE
5987 S. Rapp St.
Littleton, Colorado 80120

COMMUNITY COLLEGE OF DENVER
1001 E. 62nd Ave.
Denver, Colorado 80216

HORACE C. WILCOS REGIONAL
VOCATIONAL-TECHNICAL SCHOOL (ECPD)
Oregon Rd.
Meriden, Connecticut 06450

NORWALK STATE TECHNICAL
COLLEGE (** ECPD)
Richards Ave.
Norwalk, Connecticut 06854

WARD TECHNICAL INSTITUTE,
UNIVERSITY OF HARTFORD
315 Hudson St.
Hartford, Connecticut 06105

WELAWARE TECHNICAL AND COMMUNITY
COLLEGE, SOUTHERN BRANCH (**)
Georgetown, Delaware 19947

MIAMI CENTRAL HIGH SCHOOL
1781 N. W. 95th St.
Miami, Florida 33147

ATLANTA AREA TECHNICAL SCHOOL
1560 Stewart Ave., S.W.
Atlanta, Georgia 30310

AUGUSTA AREA TECHNICAL SCHOOL
2025 Lumpkin Rd.
Augusta, Georgia 30906

CHICAGO CITY COLLEGE,
SOUTHEAST CAMPUS (*)
8600 S. Anthony St.
Chicago, Illinois 60617

IOWA TECH AREA XV COMMUNITY
COLLEGE
Industrial Airport
Ottumwa, Iowa 52501

UNIVERSITY OF KANSAS,
EXTENSION DIVISION (*)
Lawrence, Kansas

BLUE HILLS REGIONAL TECHNICAL
SCHOOL (**)
100 Randolph St.
Canton, Massachusetts 02021

BRISTOL COMMUNITY COLLEGE
P. O. Box 133
Fall River, Massachusetts 02172

MASSACHUSETTS BAY COMMUNITY
COLLEGE
57 Stanley Ave.
Watertown, Massachusetts 02172

MASSASOIT COMMUNITY COLLEGE
1071 Washington St.
No. Abington, Massachusetts 02351

MOUNT WACHUSETT COMMUNITY
COLLEGE
Elm St.
Gardner, Massachusetts 01440

NORTH SHORE COMMUNITY
COLLEGE (**)
3 Essex St.
Beverly, Massachusetts 01915

NORTHEAST INSTITUTE OF
INDUSTRIAL TECHNOLOGY
41 Phillips St., Beacon Hill
Boston, Massachusetts

LANSING COMMUNITY COLLEGE (*)
419 N. Capitol Ave.
Lansing, Michigan 48151

SCHOOLCRAFT COLLEGE
18600 Haggerty
Livonia, Michigan 48151

WASHTENAW COMMUNITY COLLEGE
P. O. Box 345
Ann Arbor, Michigan 48107

DULUTH AREA INSTITUTE OF
TECHNOLOGY
2101 Trinity Rd.
Duluth, Minnesota 55811

DUNWOODY INDUSTRIAL INSTITUTE
818 Wayzata Blvd.
Minneapolis, Minnesota 55403

NORTHWESTERN ELECTRONICS
INSTITUTE (**)
3800 Minnehaha Ave.
Minneapolis, Minnesota 55406

MISSOURI WESTERN COLLEGE (**)
St. Joseph, Missouri 64501

SOUTHEAST MISSOURI VOCATIONAL-
TECHNICAL SCHOOL
200 Pine St.
Sikeston, Missouri 63801

RADIO ENGINEERING INSTITUTE
2610 Leavenworth
Omaha, Nebraska 68105

BURLINGTON COUNTY VOCATIONAL-
TECHNICAL HIGH SCHOOL (**)
Woodlane Rd.
Mount Holly, New Jersey 08060

CAMDEN COUNTY COLLEGE
P.O. Box 200
Blackwood, New Jersey 08012

J-C TECHNICAL INSTITUTE
880 Bergen Ave.
Jersey City, New Jersey 07306

J-C TECHNICAL INSTITUTE
201 Market St.
Paterson, New Jersey 07505

MERCER COUNTY COMMUNITY COLLEGE
101 W. State St.
Trenton, New Jersey 08608

UNION COUNTY TECHNICAL INSTITUTE
1776 Raritan Rd.
Scotch Plains, New Jersey

NEW MEXICO STATE UNIVERSITY
Las Cruces, New Mexico 88001

JAMESTOWN COMMUNITY COLLEGE (*)
525 Franklin St.
Jamestown, New York 14701

NEW YORK CITY COMMUNITY COLLEGE
300 Jay St.
Brooklyn, New York 11201

QUEENSBOROUGH COMMUNITY COLLEGE,
CITY UNIVERSITY OF NEW YORK
56th Ave. and Springfield Blvd.
Bayside, New York 11364

RALPH R. MCKEE VOCATIONAL AND
TECHNICAL HIGH SCHOOL
290 St. Marks Pl.
Staten Island, New York 10301

STATE UNIVERSITY OF NEW YORK,
AGRICULTURAL AND TECHNICAL
COLLEGE AT MORRISVILLE
Morrisville, New York 13408

CATAWBA VALLEY TECHNICAL
INSTITUTE (**)
Hickory, North Carolina 28601

DURHAM TECHNICAL INSTITUTE
P. O. Box 11307
1637 Lawson St.
Durham, North Carolina 27703

CLEVELAND TECHNICIAN SCHOOL
4600 Detroit Ave.
Cleveland, Ohio 44102

CUYAHOGA COMMUNITY COLLEGE
DISTRICT (*)
2123 E. Ninth St.
Cleveland, Ohio 44115

ERIESIDE INSTITUTE (**)
4141 Erie St.
Willoughby, Ohio 44094

MIAMI UNIVERSITY, MIDDLETOWN
BRANCH
Middletown, Ohio 45042

CENTRAL OKLAHOMA AREA
VOCATIONAL-TECHNICAL SCHOOL,
Drumright;
Temporary Address:
205 W. Main
Stroud, Oklahoma 74079

SOUTHWESTERN STATE COLLEGE
Weatherford, Oklahoma 73096

MT. HOOD COMMUNITY COLLEGE
26000 S. E. Stark St.
Gresham, Oregon 97030

BUCKS COUNTY TECHNICAL SCHOOL
Wistar Rd.
Fairless Hills, Pennsylvania 19030

COMMUNITY COLLEGE OF ALLEGHENY
COUNTY, BOYCE CAMPUS
Moss Side Blvd.
Monroeville, Pennsylvania 15146

COMMUNITY COLLEGE OF BEAVER COUNTY
609-15 Third Ave.
Freedom, Pennsylvania 15042

DELAWARE COUNTY AREA VOCATIONAL-
TECHNICAL SCHOOLS
One State Rd.
Media, Pennsylvania 19063

HARRISBURG AREA COMMUNITY COLLEGE
3300 Cameron St. Rd.
Harrisburg, Pennsylvania 17110

MASTBAUM AREA VOCATIONAL-
TECHNICAL SCHOOL (**)
Frankford Ave. and Clearfield St.
Philadelphia, Pennsylvania 19134

PENNSYLVANIA INSTITUTE OF
TECHNOLOGY
414 Sansom St.
Upper Darby, Pennsylvania 19082

SPRING GARDEN INSTITUTE
102 E. Mermaid Lane
Chestnut Hill
Philadelphia, Pennsylvania 19128

RHODE ISLAND JUNIOR COLLEGE
199 Promenade St.
Providence, Rhode Island 02908

CHESTERFIELD-MARLBORO TECHNICAL
EDUCATION CENTER
P. O. Drawer 928
Cheraw, South Carolina 29520

EKLINS INSTITUTE (**)
2603 Inwood Rd.
Dallas, Texas 75235

JAMES CONNALLY TECHNICAL
INSTITUTE
Waco, Texas 76705

PARIS JUNIOR COLLEGE
2400 Clarksville St.
Paris, Texas 75460

PARISH-DRAUGHON'S COLLEGE
409 E. Martin St.
San Antonio, Texas 87206

UTAH TECHNICAL COLLEGE AT
PROVO (**)
1395 N. 150 East
Provo, Utah 84601

VERMONT TECHNICAL COLLEGE (ECPD)
Randolph Center, Vermont 05061

UTAH TECHNICAL COLLEGE AT
SALT LAKE
4600 S. Redwood Rd.
Salt Lake City, Utah 84107

DANVILLE COMMUNITY COLLEGE
Bonner Ave.
Danville, Virginia 24541

PENINSULA VOCATIONAL TECHNICAL
EDUCATION CENTER
50th & E. Sts.
Hamptom, Virginia 23361

UNIVERSITY OF VIRGINIA,
EASTERN SHORE BRANCH
Wallops Island, Virginia 23337

LOWER COLUMBIA COLLEGE
Longview, Washington 98632

OLYMPIC COLLEGE (**)
Bremerton, Washington 98310

SKAGIT VALLEY COLLEGE (*)
Mount Vernon, Washington 98273

TACOMA VOCATIONAL-TECHNICAL
INSTITUTE (**)
1101 S. Yakima Ave.
Tacoma, Washington 98405

APPLETON VOCATIONAL, TECHNICAL,
AND ADULT SCHOOL
105 E. Kimball St.
Appleton, Wisconsin 54911

FOX VALLEY TECHNICAL COLLEGE
1919 N. Lake St.
Neenah, Wisconsin 54956

MILWAUKEE TECHNICAL COLLEGE
1015 N. Sixth St.
Milwaukee, Wisconsin 53203

TRI-CITIES STATE AREA VOCATIONAL-
TECHNICAL SCHOOL (**)
P. O. Box 246
Blountville, Tennessee 36617

OREGON TECHNICAL INSTITUTE
Oretech Post Office
Klamath Falls, Oregon 97601

DEVRY TECHNICAL INSTITUTE
4141 Belmont Ave.
Chicago, Illinois 60641

SOUTHERN TECHNICAL INSTITUTE
Marietta, Georgia

PHOENIX COLLEGE
1202 West Thomas
Phoenix, Arizona 85013

SAN ANTONIO COLLEGE
1300 San Pedro Ave.
San Antonio, Texas 78212

(*) indicates the course is offered as an extension program (usually of varying lengths of time and requiring only part-time attendance).

(**) indicates the subject is offered both as a preparatory curriculum and as extension.

(ECPD) indicates the school claims to have approval by the Engineer's Council for Professional Development.

APPENDIX B

JUNIOR/COMMUNITY COLLEGES

RANDOM SAMPLE

ALABAMA	
Mobile State Junior College	Mobile 36603
Southern Union State Junior College	Wadley 36276
ALASKA	
Kenai Penninsula Community College	Kenai 99611
ARIZONA	
Phoenix College	Phoenix 85013
CALIFORNIA	
Yuba College	Marysville 95901
Barstow College	Barstow 92311
Chaffey College	Alta Loma 91701
College Of The Siskiyous	Weed 96094
Glendale College	Glendate 91208
Los Angeles Valley College	Van Nuys 91401
Sacramento City College	Sacramenta 95822
Cypress Junior College	Cypress 90620
Golden West College	Huntington Beach 92647
COLORADO	
Northeastern Junior College	Sterling 80751
CONNECTICUT	
Hartford College For Women	Hartford 06105
Norwalk State Technical College	Norwalk 06854
FLORIDA	
Okaloosa Walton Junior College	Niceville 32578
Orlando Junior College	Orlando 32803
St. Petersburg Junior College	Pinellas Park 33565
GEORGIA	
Brunswick Junior College	Brunswick 31520
Middle Georgia College	Cochran 31014
HAWAII	
Kapiolani Community College	Honolulu 94814

ILLINOIS	
Belleville Area College	Belleville 62221
Carl Sandburg College	Galesburg 61401
Danville Junior College	Danville 61832
Olney Central College	Olney 62450
Southeastern Illinois College	Harrisburg 62946
IOWA	
Des Moines Area Community College	Ankeny 50021
Ottumwa Heights College	Ottumwa 52501
Waldorf College	Forest City 50436
KANSAS	
Hesston College	Hesston 67062
Labette Community Junior College	Parsons 67357
Pratt Community Junior College	Pratt 67124
KENTUCKY	
Fort Knox Community College	Fort Knox 40121
Southeast Community College	Cumberland 40823
MAINE	
Bliss College	Lewiston 04240
MARYLAND	
Essex Community College	Baltimore County 21237
Xaverian College	Silver Spring 20903
MASSACHUSETTS	
Becker Junior College	Worcester 01609
Bradford Junior College	Bradford 01830
Newton Junior College	Newton 02160
MICHIGAN	
Bay De Noc Community College	Escanaba 49829
Muskegon Community College	Muskegon 49443
Suomi College	Hancock 49930
MINNESOTA	
Brainerd State Junior College	Brainerd 56401
Worthington State Junior College	Worthington 56187
MISSISSIPPI	
Jefferson Davis Junior College	Handsboro 39501
Pearl River Junior College	Poplarville 39470
Forst Park Community College	St. Louis 63110
Metropolitan Junior College	Kansas City 64111
NEW HAMPSHIRE	
New Hampshire Technical Institute	Concord 03301

NEW JERSEY	
Camden County College	Blackwood 08012
Tombrock College	West Paterson 07424
NEW MEXICO	
Roswell Campus	Roswell 88201
NEW YORK	
Academy Of Aeronautics	Flushing 11371
Concordia Collegiate Institute	Bronxville 10708
Junior College of Packer Collegiate Institute	Brooklyn 11201
Kingsborough Community College	Brooklyn 11235
Presentation Jr. College Of Sacred Heart	Newburgh 12550
Sullivan County Community College	South Fallsburg 12779
NORTH CAROLINA	
Davidson County Community College	Lexington 27292
Forsyth Technical Institute	Winston Salem 27103
Martin Technical Institute	Williamston 27892
Nash Technical Institute	Rocky Mount 27801
Technical Institute of Alamance	Burlington 27215
Western Piedmont Community College	Morganton 28655
NORTH DAKOTA	
Lake Region Junior College	Devils Lake 58301
OHIO	
Clark County Technical Institute	Springfield 45505
University of Toledo Comm & Tech Coll	Toledo 43606
OKLAHOMA	
El Reno College	El Reno 73036
OREGON	
Linn Benton Community College	Albany 97321
Umpqua Community College	Roseburg 97470
PENNSYLVANIA	
Boyce Campus	Monroeville 15146
South Campus	West Mifflin 15122
Community College of Beaver County	Freedom 15042
Hazleton Campus	Hazleton 18201
SOUTH CAROLINA	
North Greenville Junior College	Tigerville 29688
Spartanburg Junior College	Spartanburg 29301
TENNESSEE	
State Technical Institute at Memphis	Memphis 38128

TEXAS	
Bee County College	Beeville 78102
Cisco Junior College	Cisco 76437
Grayson County Junior College	Denison 75020
Henderson County Junior College	Athens 75751
San Antonio College	San Antonio 78212
UTAH	
College of Eastern Utah	Price 84501
VIRGINIA	
Danville Community College	Danville 24541
New River Vocational Technical School	Radford 24141
Southwest Virginia Community College	Richlands 24641
WASHINGTON	
Centralia College	Centralia 98531
Clark College	Vancouver 98661
WEST VIRGINIA	
Potomac State College Of WV University	Keyser 26726
WISCONSIN	
Carathon County Campus	Wausau 54401
Waukesha County Technical Institute	Waukesha 53186
WYOMING	
Central Wyoming College	Riverton 82501
DISTRICT OF COLUMBIA	
Mount Vernon Junior College	Washington 20007

APPENDIX C

Letter to Selected Sample of Two-Year Colleges

ELECTROMECHANICAL TECHNOLOGY CURRICULUM SURVEY

Dear Sir:

One of the newly emerging engineering or industrial occupations is that of the Electromechanical technician - a technician who has been trained in both electronics and mechanics. A national survey is being conducted to determine the current practices of the Junior/Community Colleges regarding this new technology.

Would you please check the appropriate blanks and return this form in the enclosed envelope. In advance, thank you for your cooperation.

L. P. Robertson, Education Consultant
University Relations - Division 3134
Sandia Laboratories
Albuquerque, New Mexico 87115

- -

School Name and Location ______________________________

____

____1. We offer a separate curriculum entitled Electromechanical.

____2. We offer an electromechanical option to an existing curriculum. The basic curriculum is ____________________.

____3. We offer electromechanical courses but NO identifiable curriculum in this specialty.

____4. We do NOT offer electromechanical curriculum or courses.

____
Name

____
Date

APPENDIX D

Technician Training Directory Information for

Next Edition of

TECHNICIAN EDUCATION YEARBOOK

(Published by Prakken Publications, Inc., P. O. Box 623,
Ann Arbor, Michigan 48107

Name of Institution ______________________________

Address ______________________________

Name of Director (president, dean, director, or principal; please state title):

____

Name and title of individual in charge of technician training:

____

Type of Institution: Public__________; Private__________

Total enrolment in institution ________; enrolement in technician-training courses__________

Institution accredited by ______________________________

Admission requirements ______________________________

Technician Areas Offered
(Please check in the appropriate
columns that follow)

Technician Areas	2 Yr. Currics.	Extension Courses	ECPD Accredited
Agriculture Technologies: Agi-business technology Agricultural engineeringtechnology Soils technology			
Business-Related Technologies: Commercial Design Data Processing Statistical			
Electrical/Electronics Technologies: Aviation Electronics technology Computer technology Commercial broadcast technology Electrical technology Electro-mechanical drafting technology Electro-mechanical technology Electronic communications technology Electronic drafting technology Electronic technology Industrial electronic technology Microminiaturization technology			
Health Technologies: Dental technology Health technology Medical laboratory technology Medical records technology Medical technology Nursing Optical technology Radiation technology Sanitary engineer technology X-Ray technology			
Industrial Technologies: Ceramic technology Chemical technology Engineering Science technology Forest Products technology Graphic Arts technology Instrumentation technology Lithographic technology Metallurgical technology Nucleonics Textile Engineering technology			

Technician Areas	2 Yr. Currics.	Extension Courses	ECPD Accredited
Mechanical Technologies:			
Airconditioning, heating, and refrigeration technology			
Auto-diesel technology			
Automotive technology			
Combustion power technology			
Internal combustion (engineering) technology			
Aeronautical and astronautical (engineering) technology			
Aviation maintenance technology			
Aviation technology			
Design technology			
Drafting technology			
Fluid power (engineering) technology			
Hydraulics technology			
Industrial drafting and design technology			
Industrial illustration technology			
Industrial technology			
Machine tool technology			
Mechanical and production engineering technology			
Mechanical drafting technology			
Miscellaneous:			
Fire-protection technology			
Food-processing technology			
Others (Please list):			

APPENDIX E

ELECTROMECHANICAL TECHNOLOGY CURRICULUM

FIRST YEAR

FIRST SEMESTER

		T	L	C
ELME 1103	Unified Physics Concepts	3	2	3
ELME 1104	Circuit Analysis	2	4	4
ELME 1114	Mechanics	2	4	4
ELME 1124	Physical Mathematics	4	0	4
ELME 1102	Electromechanical Devices	1	3	2
ELME 1101	Technical Report Writing	1	0	1
		13	13	18

SECOND SEMESTER

		T	L	C
ELME 1202	Introductory Electromechanical Systems	1	3	2
ELME 1204	Mathematical Analysis	4	0	4
ELME 1203	Applied Physics Concepts	3	2	3
ELME 1214	Electronics	2	4	4
ELME 1224	Mechanical Analysis	2	4	4
		12	13	17

SECOND YEAR

FIRST SEMESTER

		T	L	C
ELME 2103	Social Science	3	0	3
ELME 2104	Electronic Logic Circuits	2	4	4
ELME 2113	Mechanics and Dynamics	2	2	3
ELME 2123	Control Devices	2	2	3
ELME 2114	Electromechanical Systems	3	3	4
		12	11	17

SECOND SEMESTER

		T	L	C
ELME 2203	Social Science	3	0	3
ELME 2213	Communication Skills	3	0	3
ELME 2233	Electromechanical Design	1	6	3
ELME 2224	Electronic Communications	2	4	4
		11	14	17

T = Theory - Hours per week
L = Laboratory - Hours per week
C = Credit - Hours per semester

NOTES: 17 graduates estimated during 1970.
Accredited by North Central Association.

APPENDIX F

ELECTROMECHANICAL TECHNOLOGY CURRICULA CONTENT

Phoenix College, Phoenix, Arizona

	T	L	C	
Technical Courses:				
Basic Electronics	5	6	7	
Digital Computer Fundamentals	3	3	4	
Electromechanical Components	3	3	4	
Control Systems	3	3	4	
Digital Computer Systems	3	6	5	
Input-Output Devices	3	3	4	
Storage Principles	3	3	4	23-27-32
Auxiliary Technical Courses:				
Drafting for Electronics	0	6	2	
Survey of Data Processing	3	0	3	3-6-5
Mathematics:				
Calculus for Electronics	3	0	3	3-0-3
Science:				
General Physics I	3	3	4	
General Physcis II	3	3	4	
Physics - Mechanisms	3	3	4	9-9-12
General Education:				
Freshman English I & II	6	0	6	
Physical Education	0	8	4	
General Psychology	3	0	3	
Electives	5	0	5	14-8-18

SUMMARY: (52-50-70)

Technical Courses	32	45.7%
Auxiliary Tech. Courses	5	7.2%
Mathematics	3	4.3%
Science	12	17.1%
General Education	18	25.7%
	70	100.0%

NOTES: Curriculum initiated in Fall semester, 1969. Student may earn an Associate in Arts degree and will receive a certificate upon completing the above curriculum.

No graduates during 1970 - new program.
Accredited by the North Central Association.

Chabot College, Hayward, California

	(Quarter Hours) T	L	C	
Technical Courses:				
Metals Processes	1½	4½	3	
Electrical Systems/Mechanisms	1	3	2	
Tool Design Fundaments	1	3	2	
EM Instrumentation/Control	2	3	3	
Materials Test Labs I & II	2	6	4	
Analysis/Design of Mechanisms I	2	3	3	
Analysis/Design of Mechanisms II	2	3	3	11½-25½-20
Auxiliary Technical Courses:				
Intro Engineering Graphics	0	6	2	
Orientation to Engineering	2	0	2	
Mechanical Drawing	0	6	2	
Intro. to Drafting	0	6	2	
Electronic Drafting	1	3	2	3-21-10
Mathematics:				
Trigonometry	5	0	5	
Slide Rule	2	0	1	7-0-6
Science:				
Physics I	3	3	4	
Physics II	3	3	4	
Physics III	3	3	4	9-9-12
General Education:				
English I & II	6	0	6	
Speech	3	0	3	
Humanities	4	0	4	
Health	3	0	3	
History	9	0	9	
Social Studies	4	0	4	
Physical Education	0	12	3	
Electives	10	0	10	39-12-42

SUMMARY: (69½-67½-90)

Technical Courses	20 (13-1/3)	22.2%
Auxiliary Tech. Courses	10 (6-2/3)	11.1%
Mathematics	6 (4)	6.7%
Science	12 (8)	13.3%
General Education	42 (28)	46.7%
	90 (60)	100.0%

NOTES: 8 graduates during 1970 estimated.
Accredited by Western Association of Schools and Colleges.

City College of San Francisco, California

Technical Courses:	T	L	C	
Introduction to Electronics I	2	4	3	
Fabrication Laboratory	0	3	1	
Introduction to Electronics II	2	3	3	
Manufacturing Processes Lab	0	6	2	
Intermediate Electronics	2	3	3	
Thermofluid Measurements Lab	1	5	2	
Elementary Vacuum Technology	1	3	2	
Advanced Metal Cutting Lab	2	7	3	
Engineering Materials	2	0	2	
Electrical Machines/Controls	3	3	4	
Introduction to Trouble Shooting	0	2	1	15-39-26
Auxiliary Technical Courses:				
Introduction to Engineering	1	0	1	
Elementary Drafting	0	6	2	
Engineering Drafting	2	7	3	
Electrical Drafting	0	6	2	3-19-8
Mathematics:				
Elementary Technical Mathematics (Algebra/Trigonometry)	4	0	3	
Basic Technical Math (Algebra/Trigonometry)	2	0	2	6-0-5
Science:				
General Physics	2	4	3	
Engineering Physics	1	3	2	
Elementary Chemistry	3	3	4	6-10-9
General Education:				
English	4	0	3	
Speech	2	0	2	
Personal Health	2	0	2	
Physical Education	0	8	2	
Industrial Relations	2	0	2	
Political Science	3	0	3	
Electives	2	0	2	15-8-16

SUMMARY: (45-76-64)

Technical Courses	26	40.6%
Auxiliary Tech. Courses	8	12.5%
Mathematics	5	7.8%
Science	9	14.1%
General Education	16	25.0%
Totals	64	100.0%

NOTES: 2 graduates in EMT estimated during 1970.
Electromechanical is part of their Industrial Technology rather than their Engineering Technology curriculum.
Accredited by Western Association.

East Los Angeles College, California

	T	L	C	
Technical Courses:				
Processing of Engineering Materials	2	3	3	
Applied Mechanics	3	0	3	
Strength of Materials Laboratory	0	3	1	
Industrial Instrumentation I	3	0	3	
Industrial Instrumentation II	3	0	3	
Electrical Circuits & Machines I	3	0	3	
Electrical Circuits & Machines II	3	0	3	
Introductory Electronics	3	0	3	
Fundamentals of Electronics	3	3	4	23-9-26
Auxiliary Technical Courses:				
Report Writing	3	0	3	
Introduction to Engineering	1	0	1	
Engineering Drawing I	1	5	3	
Electronic Drafting I	0	6	2	5-11-9
Mathematics:				
Graphic Measurements	3	0	2	
Engineering Calculations I (Algebra)	3	0	3	
Engineering Calculations II (Trig.)	3	0	3	
Engineering Calculations III (Calc.)	3	0	3	12-0-11
Science:				
Elementary Mechanical Principles (Phy)	3	0	3	3-0-3
General Education:				
Physical Education	0	8	2	
Health Education	2	0	2	
United States History	3	0	3	
Constitution and Local Government	3	0	3	
English	3	0	3	11-8-13

SUMMARY: (54-28-62)

Technical Courses	26	42.0%
Auxiliary Tech. Courses	9	14.5%
Mathematics	11	17.7%
Science	3	4.8%
General Education	13	21.0%
	62	100.0%

NOTES: 2 graduates during 1970 estimated.
Accredited by the Western Association. Curriculum is being revised adding more drafting, eliminating industrial instrumentation I and II, and permitting more technical electives. Options under the Engineering Technology curriculum include: structural, mechanical, electromechanical, civil, piping, and surveying. The differences between these options are in the electives chosen.

Long Beach City College, Long Beach, California

	T	L	C	
Technical Courses:				
Electromechanical 200A (DC, Diodes. .)	3	6	5	
Electromechanical 200B (AC, Triodes. .)	3	6	5	
Electromechanical 201A (Circ., Mech.)	3	6	5	
Electromechanical 201B (Transistors, Servo)	3	6	5	
Applied Technical Science I & II	2	4	4	14-28-24
Auxiliary Technical Courses:				
Mechanical Drawing I & II	2	10	6	
Machine Tool Operating and Practices	2	3	3	
Welding for Technicians	2	4	3	
Electrical & Electronic Drafting	1	5	3	7-22-15
Mathematics:				
Intermediate Algebra	4	0	4	
Trigonometry	3	0	3	7-0-7
Science:				
- - -				
General Education:				
United States History	3	0	3	
Politcal Science	3	0	3	
English Composition	3	0	3	
Speech	3	0	3	
Health Education	2	0	2	
Physical Education I, II, III, & IV	0	8	2	14-8-16

SUMMARY: (42-58-62)

Technical Courses	24	38.7%
Auxiliary Tech Courses	15	24.2%
Mathematics	7	11.3%
Science	00	0.0%
General Education	16	25.8%
	62	100.0%

NOTES: 15 graduates estimated during 1970
Accredited by Western Association of Schools and Colleges
This curriculum qualifies the student for the Associate in Science degree. There is another electromechanical curriculum which will satisfy the lower division requirements of the local (Long Beach) California State College degree in industrial technology.

Los Angeles Harbor College, California

	T	L	C	
Technical Courses:				
Fundamentals of Electronics I	3	3	4	
Fundamentals of Electronics II	3	3	4	
Materials Testing Lab I & II	0	6	2	
Electronics Circuits II	3	3	4	
Measurements/Testing Lab I	0	6	2	
Measurements/Testing Lab II	0	3	1	
Technical Elective	4	4	6	13-28-23
Auxiliary Technical Courses:				
Design Drafting	3	3	4	
Industrial Safety	1	0	1	4-3-5
Mathematics:				
Math of Electronics II (Alg/Trig)	5	0	5	
Math of Electronics III(Calculus)	5	0	5	10-0-10
Science:				
Technical Chemistry	3	3	4	
Technical Physics	3	3	4	6-6-8
General Education:				
Introduction to College	1	0	1	
Physical Education	0	8	2	
Communications I & II	6	0	6	
Contemporary Social Forces	3	0	3	
Health Education	2	0	2	
Politics	3	0	3	
Elective	3	0	3	18-8-20

SUMMARY: (51-45-66)

Technical Courses	23	34.8%
Auxiliary Tech. Courses	5	7.6%
Mathematics	10	15.2%
Science	8	12.1%
General Education	20	30.3%
	66	100.0%

NOTES: Accredited by the Western Association.
No graduates during 1970.

San Bernardino Valley College, California

	T	L	C	
Technical Courses:				
Electricity	2	3	3	
Electronics	2	3	3	
Manufacturing Processes	0	2	2	
Materials of Construction	0	2	2	
Computer Programming	2	3	3	
Analog Computer Applications	2	3	3	
Mechanical Instrumentation	2	4	3	
Electrical Instrumentation	2	4	3	
Engines and Turbines	3	6	5	
Materials Laboratory	0	3	1	
Statics	3	0	3	
Strength of Materials	3	0	3	21-33-34
Auxiliary Technical Courses:				
Engineering Drafting	0	6	2	
Boolean Electricity	1	0	1	
Machine Shop	0	6	2	1-12-5
Mathematics:				
Vector Algebra/Anal. Geometry	3	0	3	
Introductory Calculus	3	0	3	6-0-6
Science:				
Physics I	4	0	4	
Physics II	4	0	4	8-0-8
General Education:				
Physical Education	0	20	3	
English	3	0	3	
History	3	0	3	
Political Science	3	0	3	
Speech	3	0	3	
Related Arts	6	0	6	18-20-21

SUMMARY: (54-65-74)

Technical Courses	34	45.9%
Auxiliary Tech Courses	5	6.8%
Mathematics	6	8.1%
Science	8	10.8%
General Education	21	28.4%
	74	100.0%

NOTES: 5 graduates estimated during 1970.
Accredited by Western Association - considering applying for accreditation by ECPD.

Arapahoe Junior College, Littleton, Colorado

	T	L	C	
Technical Courses:				
Statics and Dynamics	3	2	4	
AC-DC Circuits	2	6	4	
Strength of Materials	3	3	4	
AC-DC Machines	2	6	4	
Manufacturing Processes	2	3	3	
Hydraulics & Pneumatics	2	3	3	
Transistors & Vacuum Tubes	2	6	4	
Instrumentation	2	6	4	
Electronic Circuits	3	6	5	
Mechanisms I	3	3	4	
Systems Design	1	6	3	
Tutorials	6	0	6	33-52-51
Auxiliary Technical Courses:				
Drafting I, II, & III	0	27	9	0-27-9
Mathematics:				
Math I (Algebra)	4	0	4	
Math II & III (Calculus)	6	0	6	
Trigonometry	2	0	2	12-0-12
Science:				
Physics I	2	4	4	
Physics II & III	6	4	8	8-8-12
General Education:				
Communications I, II, & III	9	0	9	
Speech	3	0	3	
Industrial Organizations	3	0	3	
Humanities Elective	3	0	3	
Physical Education	0	6	3	21-6-24

SUMMARY: (74-93-108)

Technical Courses	51	(34)	47.2%
Auxiliary Tech. Courses	9	(6)	8.4%
Mathematics	12	(8)	11.1%
Science	12	(8)	11.1%
General Education	14	(16)	22.2%
	108	(72)	100.0%

NOTES: No graduates during 1970 - new program and new college. Candidacy status with the North Central Association. This curriculum is one of four options of the Industrial Technology program. Other options are electronic, mechanical, and drafting. All options lead to the Associate in Applied Science degree.

Norwalk State Technical College, Norwalk, Connecticut

	T	L	C	
Technical Courses:				
Electricity I & II	6	6	8	
Electrical Circuits I & II	6	6	8	
Electrical Machines	4	3	5	
Electronics I, II, & III	9	9	12	
Controls and Servos	3	2	4	
EM Design I	2	2	3	
Fluid Mechanics	3	2	4	
EM Design II	3	5	5	
Controls/Mechanical Systems	3	3	4	
Applied Mechanisms	3	2	4	42-40-57
Auxiliary Technical Courses:				
Introductory Drawing	0	4	2	
Electrical Drafting	0	3	1	
Fortran Programming	2	2	3	
Digital Logic	3	3	4	5-12-10
Mathematics:				
Technical Math I & II	8	0	8	
Calculus I & II	8	0	8	
Advanced Applied Math	3	2	4	15-10-20
Science:				
Physics I, II, & III	9	6	12	
Chemistry I & II	6	4	8	15-10-20
General Education:				
English I, II, & III	9	0	9	
Economics	3	0	3	
Human Relationships	3	0	3	
Industrial Organization	3	0	3	18-0-18

SUMMARY: (99-64-125)

Technical Courses	57	(38)	45.6%
Auxiliary Tech Courses	10	(6 2/3)	8.0%
Mathematics	20	(13 1/3)	16.0%
Science	20	(13 1/3)	16.0%
General Education	18	(12)	14.4%
	125	(83-1/3)	100.0%

NOTES: 10 graduates estimated during 1970. Accredited by ECPD. Seriously considering reducing the total number of hours required in this curriculum.

Ward Technical Institute, Hartford, Connecticut

Technical Courses	T	L	C	
Basic Electricity	3	3	4	
Basic Electronics	3	3	4	
Non-Linear Circuit Analysis	3	3	4	
Linear Circuit Analysis	3	3	4	
Data Storage & Logic Circuits	3	3	4	
Mechanisms	3	3	4	
Input/Output Devices	3	3	4	
Data Processing Systems	3	3	4	24-24-32
Auxiliary Technical Courses:				
Electronic Graphics	1	2	2	1-2-2
Mathematics:				
Mathematics I	3	0	3	
Mathematics II	3	0	3	
Differential/Integral Calculus I	3	0	3	
Calculus II	3	0	3	12-0-12
Science:				
Physical Science I	3	2	4	
Physical Science II	3	2	4	6-4-8
General Education:				
Western Civilization I	3	0	3	
General Psychology	3	0	3	
Intro. to Sociology	3	0	3	
Principles of Economics	3	0	3	
English I and II	6	0	6	18-0-18

SUMMARY: (61-30-72)

Technical Courses	32	44.4%
Auxiliary Tech. Courses	2	2.8%
Mathematics	12	16.7%
Science	8	11.1%
General Education	18	25.0%
	72 hrs.	100.0%

NOTES: 20 graduates during 1970 estimated.
Accredited by the Connecticut Board of Education - operates as a semiautonomous affiliated school, fully responsible to the regents of the University of Hartford.

Southern Technical Institute, Marietta, Ga.

(Quarter System)

	T	L	C	
Technical Courses:				
Microphysical View of Materials	3	0	3	
Electronic Devices	3	3	4	
Circuit Analysis	5	3	6	
Electric/Magnetic Fields	5	3	6	
Semiconductor Circuits	5	3	6	
Computer Fundamentals	3	3	4	
Electromechanical Devices	2	3	3	
Circuit Analysis	3	3	4	
Electronic Applications	3	3	4	
Pulse/Digital Circuits	5	3	6	
Programming Circuits	5	3	6	42-30-52
Auxiliary Technical Courses:				
Engineering Drawing I	0	6	2	
Technical Writing	3	0	3	
Computer Programming	0	3	1	3-9-6
Mathematics:				
Algebra	5	0	5	
Trigonometry	5	0	5	
Analytical Geom./Calculus	5	0	5	15-0-15
Science:				
Physics Survey	5	0	5	
Physics (Mechanics)	5	3	6	
Physics (Ht., Sound, Light)	3	3	4	
Modern Physics	2	0	2	15-6-17
General Education:				
Language & Logic	3	0	3	
Composition & Rhetoric I & II	6	0	6	
Public Speaking	3	0	3	12-0-12

SUMMARY: (87-45-102)

Technical Courses	52	(34 2/3)	51.0%
Auxiliary Tec. Courses	6	(4)	5.9%
Mathematics	15	(10)	14.7%
Science	17	(11 1/3)	16.6%
General Education	12	(8)	11.8%
	102	(68)	100.0%

NOTES: This curriculum is the Electronic Computer and Control Option to the Electrical Engineering Technology curriculum.
5 graduates estimated during 1970.
Accredited by the Southern Association (part of Georgia Tech.)

Blue Hills Regional Technical Institute, Conton, Massachusetts

	T	L	C	
Technical Courses:				
Electrical Circuits I	4	4	5	
Electrical Circuits II	4	4	5	
Mechanics	1	4	2	
Electromechanics I	3	4	4	
Electronics I	4	6	5	
Digital Electronics	2	3	3	
Electro-Mechanics	3	4	4	
Electronics II	4	6	5	25-35-33
Auxiliary Technical Courses:				
Engineering Graphics & Design	1	4	2	
Technical Communications	3	0	3	4-4-5
Mathematics:				
Technical Mathematics I (Algebra)	3	0	3	
Technical Mathematics II (Tri/Analy Geom)	3	0	3	
Applied Calculus	5	0	4	11-0-10
Science:				
General Physics I & II	6	6	8	6-6-8
General Education:				
English Composition & Literature I	3	0	3	
Principles of Economics	3	0	3	
English Composition & Literature II	3	0	3	
General Psychology	3	0	3	
Introductory Sociology	3	0	3	15-0-15

SUMMARY: (61=45-71)

Technical Courses	33	46.5%
Auxiliary Tech Courses	5	7.0%
Mathematics	10	14.1%
Science	8	11.3%
General Education	15	21.1%
	71	100.0%

NOTES: No graduates during 1970
Accredited by New England Association

Bristol Community College, Fall River, Mass.

Technical Courses	T	L	C	
Electrical Circuits I & II	6	6	8	
Fund. of Digital Computers	3	3	4	
Electronic Theory I	3	6	5	
Electronic Theory II	3	6	5	15-21-22
Auxiliary Technical Courses:				
Principles of Engr Drawing	2	4	2	
Machine Drawing	2	4	3	
Intro. to Data Processing	3	0	3	
Mechanisms & Machine Drawing	2	4	3	9-12-11
Mathematics:				
Tech. Mathematics I (Algebra/Trig)	4	0	4	
Tech. Mathematics II (Calculus)	4	0	4	8-0-8
Science:				
Technical Physics I	3	3	4	
Technical Physics II	3	3	4	6-6-8
General Education:				
Freshman English I & II	6	0	6	
American Civilization I & II	6	0	6	
Human Relations in Business	3	0	3	
Health, Humanities, or Social Science Electives	5	0	5	20-0-20

SUMMARY: (58-39-69)

Technical Courses	22	31.9%
Auxiliary Tech. Courses	11	15.9%
Mathematics	8	11.6%
Science	8	11.6%
General Education	20	29.0%
	69	100.0%

NOTES: 18 graduates during 1970 estimated.
Recognition of Candidacy for Accreditation with the New England Association of Colleges and Secondary Schools.

Massasoit Community College, North Abinton, Mass.

	T	L	C	
Technical Courses:				
Electricity and Electronics I	3	2	4	
Electricity and Electronics II	3	2	4	
Mechanics/Strength of Materials	3	2	4	
Machine/Fixture Design	3	0	3	
Tubes/Semiconductor Devices	3	2	3	
Manufacturing Processes	3	2	3	
Motors and Controls OR Pulse and Digital Circuits	3	2	4	21-12-25
Auxiliary Technical Courses:				
Engineering Graphics I & II	0	8	4	0-8-4
Mathematics:				
Technical Mathematics	4	0	4	
Technical Mathematics x/Calculus	4	0	4	8-0-8
Science:				
Physics I	3	2	4	
Physics II	3	2	4	6-4-8
General Education:				
English Composition I & II	6	0	6	
Speech	3	0	3	
Social Science Electives	6	0	6	
Humanities Electives	6	0	6	21-0-21

SUMMARY: (56-24-66)

Technical Courses	25	37.9%
Auxiliary Tech Courses	4	6.1%
Mathematics	8	12.1%
Science	8	12.1%
General Education	21	31.8%
	66	100.0%

NOTES: 6 graduates during 1970 estimated.
Recognition of Candidacy for Accreditation with the New England Association of Colleges and Secondary Schools.

Mount Wachusett Community College, Gardner, Mass.

	T	L	C	
Technical Courses:				
Circuit Theory I	3	3	4	
Circuit Theory II	3	3	4	
Statics	3	0	3	
Electronics I	2	3	3	
Strength of Materials	3	3	4	
Electronics II	2	3	3	
Machine Design	3	3	4	19-18-25
Auxiliary Technical Courses:				
Computer Programming	3	0	3	
Engineering Graphics I & II	0	8	4	3-8-7
Mathematics:				
Technical Mathematics I	3	0	3	
Technical Mathematics II (Calc)	3	0	3	6-0-6
Science:				
Applied Physics I	2	3	3	
Applied Physics II	2	3	3	4-6-6
General Education:				
Speech	2	0	2	
English Composition/Lit. I	3	0	3	
English Compositon/Lit, II	3	0	3	
Humanities Elective	3	0	3	
Social Science Electives	6	0	6	17-0-17

SUMMARY: (49-32-61)

Technical Courses	25	41.0%
Auxiliary Courses	7	11.5%
Mathematics	6	9.8%
Science	6	9.8%
General Education	17	27.8%
	61	100.0%

NOTES: This curriculum is entitled: "Engineering Technology" and "mastery of this curriculum prepares graduates for employment as highly skilled technicians in a broad field of Electro-Mechanical Technology."

12 graduates during 1970 estimated.
Accredited by New England Association of Colleges and Secondary Schools.

North Shore Community College, Beverly, Mass.

	T	L	C	
Technical Courses:				
Fundamentals of Electronics I & II	10	4	12	
Manufacturing Processes and Machine Design I & II	6	6	8	
Tubes and Semiconductors	4	2	5	
Electric Control Systems	2	2	3	
Industrial Electronics	3	2	4	
Digital Circuit Theory	3	2	4	28-18-36
Auxiliary Technical Courses:				
Engineering Drawing I & II	2	4	4	2-4-4
Mathematics:				
Technical Mathematics I (Algebra)	4	0	4	
Technical Mathematics II (Trig)	4	0	4	8-0-8
Science:				
Introductory Physics I	2	2	4	2-2-4
General Education:				
English Composition I & II	6	0	6	
Psychology of Social Relations	3	0	3	
Man in Society	3	0	3	
Elective(may be in Math, Science,or in General Education)	3	0	3	15-0-15

SUMMARY: (55-24-67)

Technical Courses	36	53.7%
Auxiliary Tech Courses	4	6.0%
Mathematics	8	11.9%
Science	4	6.0%
General Education	15	22.4%
	67	100.0%

NOTES: 10 graduates during 1970 estimated.
Candidacy status for accreditation with New England Association.

Washtenaw Community College, Ann Arbor, Michigan

	T	L	C	
Technical Courses:				
Electrical Fundamentals & Lab I	3	6	5	
Electrical Fundamentals & Lab II	3	6	5	
Machine Tool Operation	0	6	4	
Introduction to Numerical Control	1	2	2	
Fluid Power Fundamentals	3	2	4	
Basic Electronics	2	4	4	
Machine Maintenance	0	6	3	
Machine Tool Technology	2	4	4	
Industrial Electricity	2	4	4	
Numerical Control Programming	2	2	3	18-42-38
Auxiliary Technical Courses:				
Blueprint Reading	3	0	3	
Technical Drawing	0	6	3	
Machine Shop Practices	1	2	3	
Fundamentals of Welding	1	3	2	5-11-11
Mathematics:				
Algebra and Trigonometry	4	0	4	4-0-4
Science:				
(none)	0	0	0	0-0-0
General Education:				
English Composition	3	0	3	
Labor Relations	3	0	3	
Government and Society	3	0	3	9-0-9

SUMMARY: (38-51-62)

Technical Courses	38	61.3%
Auxiliary Tech Courses	11	17.7%
Mathematics	4	6.5%
Science	00	0.0%
General Education	9	14.5%
	62	100.0%

NOTES: No graduates during 1970.
Candidate for accreditation by North Central Association.

Camden County College, Blackwood, New Jersey

	T	L	C	
Technical Courses:				
Electrical & Electronic Principles	2	4	4	
Electronic Measurements	2	4	4	
Computer Science	2	0	2	
Mechanical Measurements	2	4	4	
Electronic Circuit Analysis	2	2	3	
Hybrid Systems - Measurement/Analysis	2	4	4	
Fluidics	2	4	4	
Thermodynamics	2	2	3	16-24-28
Auxiliary Technical Courses:				
Engineering Graphics	1	4	3	
Industrial Seminar	1	0	1	2-4-4
Mathematics:				
Mathematics I (Algebra)	4	0	4	
Mathematics II (Trigonometry)	4	0	4	
Mathematics III (Calculus)	4	0	4	12-0-12
Science:				
Physics I	2	4	4	
Physics II	2	4	4	4-8-8
General Education:				
English Composition I	3	0	3	
English Composition II	3	0	3	
Physical Education I	0	2	1	
Principles of Economics	3	0	3	
Physical Education II	0	2	1	
Health I	0	2	1	
Sociology	3	0	3	
Elective	3	0	3	15-6-18

SUMMARY: (49-42-70)

Technical Courses	28	40.0%
Auxiliary Tech Courses	4	5.7%
Mathematics	12	17.2%
Science	8	11.4%
General Education	18	25.7%
	70	100.0%

NOTES: No graduates estimated during 1970. New program.
Recognized Candidate for Middle States accreditation.

Mercer County Community College, Trenton, New Jersey

	T	L	C	
Technical Courses:				
Electric Circuits/Machines I	3	3	4	
Electric Circuits/Machines II	3	3	4	
Applied Hydraulics	3	3	4	
Mechanics of Materials	3	3	4	
Electronics I & II	4	6	6	
ElectroMechanical Devices I & II	2	6	4	
Applied Thermodynamics	2	0	2	
Manufacturing Processes	1	3	2	
Fluid Power	1	3	2	22-30-32
Auxiliary Technical Courses:				
Engineering Graphics	1	3	2	
Technical Writing	3	0	3	
Graphical Problems	0	6	2	4-9-7
Mathematics:				
Algebra/Trigonometry	5	0	5	
Analytic Geometry/Calculus	5	0	5	10-0-10
Science:				
Physics/Chemistry I	3	3	4	
Physics/Chemistry II	3	3	4	6-6-8
General Education:				
English (2 courses)	6	0	6	
Social Science Elective (2 courses)	6	0	6	
Personal/Family Health I & II	2	0	2	14-0-14

SUMMARY: (56-45-71)

Technical Courses	32	45.1%
Auxiliary Tech Courses	7	9.8%
Mathematics	10	14.1%
Science	8	11.3%
General Education	14	19.7%
	71	100.0%

NOTES: 6 graduates during 1970 estimated.
Recognized Condidate for Accrediation by the Middle States Association.

Union County Technical Institute, Scotch Plains, N. J.

(Quarter hours)

	T	L	C	
Technical Courses:				
Electrical Fundamentals	4	9	8	
Electrical Circuits	5	9	8	
Digital Computer Fundamentals I	5	9	8	
Digital Computer Fundamentals II	5	9	8	
Mechanisms	2	3	3	
Digital Computer Systems	5	9	8	
Field Project	1	20	2	
Technical Elective	2	3	3	29-71-48
Auxiliary Technical Courses:				
Technical Graphics	1	3	2	
Technical Elective	3	0	3	
Technical Writing	4	0	4	
Core Seminar	2	0	2	10-3-11
Mathematics:				
Technical Mathematics I (Algebra)	4	0	4	
Tech. Mathematics II (Trigonometry)	4	0	4	
Analytical Geometry	4	0	4	
Calculus	4	0	4	16-0-16
Science:				
Physics (Mechanics)	3	3	4	
Physics (Heat)	3	3	4	
Physics (Waves)	3	3	4	9-9-12
General Education:				
English	4	0	4	
Humanities Electives (5 courses)	20	0	20	24-0-24

SUMMARY: (88-83-111)

Technical Courses	48 (32)	43.2%
Auxiliary Tech. Courses	11 (7 1/3)	10.0%
Mathematics	16 (10 2/3)	14.4%
Science	12 (8)	10.8%
General Education	24 (16)	21.6%
	111 (74)	100.0%

NOTES: Program started in September 1969 with 15 students enrolled.
No graduates during 1970.
Approved by New Jersey State Department of Higher Education.

New York City Community College, Brooklyn, N. Y.

	T	L	C	
Technical Courses:				
Electrical Circuits & Lab	4	2	5	
Electronics & Lab	3	3	4	
Mechanisms & Lab	3	3	4	
Storage Principles/Devices	3	2	4	
Data Machines & Components	5	4	6	
Input/Output Devices I	3	2	4	
Input/Output Devices II	3	2	4	
Logic Systems	2	0	2	
Data Processing Systems	5	4	6	31-22-39
Auxiliary Technical Courses:				
Technical Graphics	1	3	2	
Tool Skills Laboratory	0	3	1	1-6-3
Mathematics:				
Mathematical Analysis I	4	0	4	
Math Analysis II (Calculus)	4	0	4	8-0-8
Science:				
Physics I	3	2	4	
Physics II	3	2	4	6-4-8
General Education:				
English Composition I	4	0	3	
Social Science Electives	9	0	9	
Communication Elective	3	0	3	16-0-15

SUMMARY: (62-32-73)

Technical Courses	39	53.4%
Auxiliary Tech Courses	3	4.1%
Mathematics	8	11.0%
Science	8	11.0%
General Education	15	20.5%
	73	100.0%

NOTES: 9 graduates during 1970 estimated.
Accredited by the Middle States Association.

New Mexico State University, Las Cruces, N. M.

	T	L	C	
Technical Courses:				
Applied Electricity	3	3	4	
Industrial Processes I	1	3	2	
Applied Mechanics	4	3	2	
Control Systems	3	3	4	
Industrial Processes II	2	3	3	
Engineering Materials	1	3	2	
Electrical Machines	2	3	3	
Machine Elements	1	3	2	17-24-25
Auxiliary Technical Courses:				
Engineering Graphics	1	4	3	
Introduction to Technology	1	0	1	
Report Writing	2	0	2	
Mechanical Detailing	2	6	4	
Building Utilities	2	3	3	
Electronic Drafting	0	3	1	8-16-14
Mathematics:				
Technical Mathematics I (Alg)	4	0	4	
Technical Mathematics II (Calc)	5	0	5	9-0-9
Science:				
Physics	4	0	4	
Chemistry	3	3	4	7-3-8
General Education:				
Composition	3	0	3	
Industrial Organizations	3	0	3	
Humanities/Social Studies	6	0	6	
Public Speaking	2	0	2	14-0-14

SUMMARY: (55-43-70)

Technical Courses	25	35.7%
Auxiliary Tech. Courses	14	20.0%
Mathematics	9	12.9%
Science	8	11.4%
General Education	14	20.0%
	70	100.0%

NOTES: 2 graduates during 1970 estimated.
Accredited by North Central Association.

Catawba Valley Technical Institute, Hickory, North Carolina
(Quarter Hours)

	T	L	C	
Technical Courses:				
Fundamentals of Electricity I	4	6	6	
Fundamentals of Electricity II	4	6	6	
Control Devices	5	6	7	
Electronic Instruments	1	6	3	
Machine Processes	2	4	3	
Fundamental Machanisms	2	4	4	
EM Systems I	3	2	4	
EM Systems II	3	6	5	
Hydraulics/Pneumatics	3	3	4	
Digital Computers	3	0	3	
EM Systems III	3	6	6	
Wave Shaping and Pulse Circuits	2	2	3	35-51-54
Auxiliary Technical Courses:				
Technical Drafting	2	6	4	
Report Writing	3	0	3	5-6-7
Mathematics:				
Algebra/Trigonometry	5	0	5	
Trig/Analytical Geometry	5	0	5	
Calculus	5	0	5	15-0-15
Science:				
Physics I	3	2	4	
Physics II	3	2	4	
Physics III	3	2	4	9-6-12
General Education:				
Grammar	3	0	3	
Composition	3	0	3	
Oral Communications	3	0	3	
Electives	15	0	15	24-0-24

SUMMARY: (88-63-112)

Technical Courses	54	(36)	48.2%
Auxiliary Tech. Courses	7	(4 2/3)	6.3%
Mathematics	15	(10)	13.4%
Science	12	(8)	10.7%
General Education	24	(16)	21.4%
	112	(74 2/3)	100.0%

NOTES: 3 graduates during 1970 estimated.
Approved by the North Carolina State Board of Education and is a corresponding institution with the Southern Association.

Oklahoma State University, Stillwater, Oklahoma

	T	L	C	
Technical Courses:				
Circuit Analysis (DC/AC)	2	4	4	
Mechanics	2	4	4	
Electromechanical Devices	1	3	2	
Introductory EM Systems	1	3	2	
Electronics	2	4	4	
Mechanical Analysis	2	4	4	
Electronic Logic Circuits	2	4	4	
Mechanics & Dynamics	2	2	3	
Control Devices	2	2	3	
Electromechanical Systems	3	3	4	
Electromechanical Design	1	6	3	
Automatic Control Systems	2	4	4	
Electronic Communications	2	4	4	24-47-45
Auxiliary Technical Courses:				
Technical Report Writing	1	0	1	1-0-1
Mathematics:				
Physical Mathematics (Alg./Trig.)	4	0	4	
Mathematical Analysis (Calculus)	4	0	4	8-0-8
Science:				
Unified Physics Concepts	3	2	3	
Applied Physics Concepts	3	2	3	6-4-6
General Education:				
Social Science	6	0	6	
Communication Skills	3	0	3	9-0-9

SUMMARY: (48-51-69)

Technical Courses	45	65.2%
Auxiliary Tech Courses	1	1.5%
Mathematics	8	11.6%
Science	6	8.7%
General Education	9	13.0%
	69	100.0%

NOTES: 17 Graduates during 1970.
Accredited by North Central Association.

Oregon Technical Institute, Klamath Falls, Oregon

	(3-year Curriculum)			
Technical Courses:	T	L	C	
Electronics	3	12	7	
A. C. Components	3	12	7	
Semiconductors/Transistors	3	10	6	
Vacuum Tubes	2	3	3	
Electronic Circuits	3	12	7	
Circuit Analysis	3	2	4	
Pulse Techniques	3	2	4	
Advanced Circuit Diagnosis	0	10	3	
Advanced Elec. Circuits	3	2	4	
Mechanisms I	2	2	3	
Logic Circuits	2	3	3	
Mechanisms II	2	4	3	
Input/Output Devices	6	6	8	
Data Processing Systems	6	6	8	
Storage Principles	2	3	3	(43-89-73)
Auxiliary Technical Courses:				
Electronic Drafting	1	4	2	
Intro Data Processing	2	2	3	
Computer Programming	2	1	2	
Tech Report Writing	3	0	3	
E-M Drafting	0	6	2	8-13-12)
Mathematics:				
Algebra/Trigonometry	8	0	8	
Calculus	12	0	12	(20-0-20)
Science:				
Physics I, II, & III	9	9	12	(9-9-12)
General Education:				
Physical Education	1	15	6	
English Compositions I & II	6	0	6	
Psychology (3 courses)	9	0	9	
Social Science (3 courses)	9	0	9	
Managerial Accounting	3	2	4	
Elective	3	0	3	(31-17-37)

SUMMARY: (111-128-154)

Technical Courses	73	(48 2/3)	47.4%
Auxiliary Technical Courses	12	(8)	7.8%
Mathematics	20	(13 1/3)	13.0%
Science	12	(8)	7.8%
General Education	37	(24 2/3)	24.0%
	154	(102 2/3)	100.0%

NOTES: Accredited by N. W. Association; AAS degree for 3 years. Bachelor's degree after one additional year; in June 1970 15 AAS graduates and 9 Bachelor graduates.

Harrisburg Area Community College, Pennsylvania

	T	L	C	
Technical Courses:				
Equipment Utilization	0	3	1	
DC Circuits	3	3	4	
AC Circuits	3	3	4	
Industrial Electronics	3	3	4	
Elementary Mechanics	4	0	3	
Digital Computer Principles	3	3	4	
Computer Mechanisms	3	3	4	
Motor Controls & Servos	3	3	4	
Auto Control Devices	3	3	4	25-24-32
Auxiliary Technical Courses:				
Engineering Graphics	0	6	2	
Fortran Programming	3	0	3	3-6-5
Mathematics:				
Algebra/Trigonometry	5	0	5	
Basic Calculus	3	0	3	8-0-8
Science:				
Technical Physics	3	3	4	3-3-4
General Education:				
English I and II	6	0	6	
Speech	3	0	3	
Humanities	3	0	3	
Social Science	3	0	3	
Engineering Economics	3	0	3	18-0-18

SUMMARY: (57-33-67)

Technical Courses	32	47.8%
Auxiliary Tech. Courses	5	7.5%
Mathematics	8	11.9%
Science	4	5.9%
General Education	18	26.9%
	67	100.0%

NOTES: No graduates during 1970 - New program.

Spring Garden Institute, Philadelphia, Pennsylvania

	T	L	C	
Technical Courses:				
Materials Science	3	2	4	
Introduction Digital Computers	3	0	3	
Electrical Principles I	2	3	3	
Programming Methods	3	0	3	
Electrical Principles II	2	3	3	
Machine Programming	2	4	4	
General Electronics	3	2	4	
Computer Peripheral Equipment	3	2	4	
Mechanisms	2	2	3	
Fortran Programming	4	0	4	
Storage Principles	4	0	4	
Small Computer Programming	2	2	3	
Servo-Mechanisms	2	2	3	
Elective	3	2	4	38-24-49
Auxiliary Technical Courses:				
Graphics I	0	3	1	
Electronic Graphics	0	3	1	0-6-2
Mathematics:				
Mathematics I	4	0	4	
Mathematics II	4	0	4	
Calculus I	4	0	4	
Calculus II	4	0	4	16-0-16
Science:				
Physics I	3	2	4	
Physics II	3	2	4	
Physics III	3	2	4	9-6-12
General Education:				
Psychology I	3	0	3	
English Composition I & II	6	0	6	
Speech or Literature	3	0	3	
Humanities Electives	6	0	6	
Liberal Arts Electives	3	0	3	
Business Electives	7	0	7	28-0-28

SUMMARY: (91-36-107)

Technical Courses	49	(32 2/3)	45.8%
Auxiliary Tech Courses	2	(1 1/3)	1.9%
Mathematics	16	(10 2/3)	14.9%
Science	12	(8)	11.2%
General Education	28	(18 2/3)	26.2%
	107	(71 1/3)	100.0%

NOTES: Member of the Technical Consortium. 5 graduates estimated during 1970. Name of the program is being changed next year from Electro-Mechanical Technology to Computer Engineering Technology.

Chesterfield-Marlboro Technical Education Center

Cheraw, South Carolina

	T	L	C	
	(Quarter Hours)			
Technical Courses:				
DC Theory/Application	5	3	6	
AC Theory/Application	5	3	6	
Electrical Circuits I	3	3	4	
Electronics	3	3	4	
Industrial Electronics I	3	3	4	
Statics	3	3	4	
Hydraulics/Pneumatics	3	3	4	
Industrial Electronics II	3	3	4	
AC Machines/Controls	5	3	6	
Dynamics	3	0	3	
Fluid Mechanics	3	3	4	
Machine Design I	3	3	4	
Industrial Electronics III	5	3	6	
Numerical Control Systems	3	9	6	(50-45-65)
Auxiliary Technical Courses:				
Engineering Drawing I	0	6	2	
Electronic Drafting	0	3	1	
Technical Writing	3	0	3	(3-9-6)
Mathematics:				
Algebra	5	0	5	
Algebra & Trigonometry	5	0	5	
Analytical Geometry	5	0	5	
Calculus	5	0	5	(20-0-20)
Science:				
General Chemistry I	3	3	4	
Physics I	3	3	4	
General Chemistry II	3	3	4	
Physics II	3	3	4	
Physics III	3	3	4	(15-15-20)
General Education:				
Communications I	5	0	5	
Economics	3	0	3	
Human Relations	3	0	3	
Industrial Org/Mangmt	3	0	3	(14-0-14)

SUMMARY: (102-69-125)

Technical Courses	65	(43 1/3)	52.0%
Auxiliary Tech.	6	(4)	4.8%
Mathematics	20	(13 1/3)	16.0%
Science	20	(13 1/3)	16.0%
General Education	14	(9 1/3)	11.2%
	125	(83 1/3)	100.0%

NOTES: Program initiated in Fall, 1969. Applied for accrediation by the Southern Association. No graduates during 1970.

San Antonio College, San Antonio, Texas

	T	L	C	
Technical Courses:				
Basic Electronics I	6	8	8	
Basic Electronics II	6	4	8	
Electronics Instrumentation	3	3	4	
Digital Electronics	3	3	4	
Digital Applications	3	3	4	
Electromechanical Devices	3	3	4	
Digital Project	0	6	2	
Precision Measurement	1	3	2	25-33-36
Auxiliary Technical Courses:				
Fortran Computer Programming	3	0	3	
Introduction to Records	3	0	3	6-0-6
Mathematics:				
Electronics Math (Alg/Trig)	6	0	6	
Electronics Problems and Systems with Calculus	6	4	6	12-4-12
Science:				
Introductory Physics I	3	2	3	
Introductory Physics II	3	2	3	6-4-6
General Education:				
English Composition I	3	0	3	
English Composition II	3	0	3	
American Government	3	0	3	9-0-9

SUMMARY: (58-41-69)

Technical Courses	36	52.2%
Auxiliary Tech Courses	6	8.7%
Mathematics	12	17.4%
Science	6	8.7%
General Education	9	13.0%
	69	100.0%

NOTES: No graduates during 1970 - new program.
Accredited by the Southern Association.
The laboratory is used in the second mathematics course to illustrate the application of Calculus to electronic systems.

Danville Community College, Danville, Virginia

	(Quarter Hours) T	L	C	
Technical Courses:				
Fundamentals of DC & AC	6	6	8	
Mechanisms	1	3	2	
Circuit Analysis	3	3	4	
Mechanics	3	0	3	
Electronics	3	3	4	
Fluid Mechanics	3	3	4	
Applied Mechanics	3	2	3	
Electro-Mechanical Systems I,II & III	10	9	13	
Pulse/Switching Circuits	2	3	3	
Hydraulics/Pneumatics	3	3	4	37-35-48
Auxiliary Technical Courses:				
Machine Laboratory (Shop)	1	3	2	
Blueprint Reading I, II, & III	3	9	6	4-12-8
Mathematics:				
Engineering Technician Math I, II, & III (Algebra/Trig)	15	0	15	
Modern Mathematics	3	0	3	18-0-18
Science:				
Physics I, II, & III	9	9	12	9-9-12
General Education:				
Orientation	1	1	1	
English I & II	6	0	6	
Speech Communications	2	2	3	
Introduction to Economics	3	0	3	
American Constitutional Government	3	0	3	
Principles of Applied Psychology	3	0	3	
Physical Education I, II, & III	0	9	3	18-12-22

SUMMARY: (86-68-108)

Technical Courses	48	(32)	44.4%
Auxiliary Tech Courses	8	(5 1/3)	7.4%
Mathematics	18	(12)	16.7%
Science	12	(8)	11.1%
General Education	22	(14 2/3)	20.4%
	108	(72)	100.0%

NOTES: No graduates during 1970 - New program.
Correspondent of the Southern Association. The above curriculum is the "general" option of EMT-there is an option proposed called "computer electronics:.

Vermont Technical College, Randolph Center, Va.

	T	L	C	
Technical Courses:				
Measuring Principles	2	3	3	
DC Measurements Lab	0	3	1	
AC-DC Circuits	2	3	3	
Fundamentals of Electronics	3	3	4	
Transducer Measurements	2	3	3	
Control Systems I	3	3	4	
Computer Principles	3	3	4	
Instrumentation Principles	3	3	4	
Control Systems II	3	3	4	
Instrumentation Project	1	6	3	22-33-33
Auxiliary Technical Courses:				
Technical Drafting I	0	6	2	
Technical Drafting II	0	6	2	
Computer Programming	2	0	2	
Instrument Shop Practices	0	3	1	2-15-7
Mathematics:				
Technical Mathematics	5	0	5	
Calculus	4	0	4	9-0-9
Science:				
Physics I	3	3	4	
Physics II	3	3	4	6-6-8
General Education:				
Physical Education I & II	0	4	0	
Principles of Economics	3	0	3	
Introduction to Philosophy	3	0	3	
Human Relations	3	0	3	
English I & II	6	0	6	15-4-15

SUMMARY: (54-58-72)

Technical Courses	33	45.8%
Auxiliary Tech Courses	7	9.7%
Mathematics	9	12.5%
Science	8	11.2%
General Education	15	20.8%
	72	100.0%

NOTES: Emphasis is upon instrumentation measurement and upon control functions. This curriculum is accredited by ECPD. 9 graduates during 1970 estimated.

Lower Columbia College, Longview, Washington

	(Quarter Hours) T	L	C	
Technical Courses:				
Statics	3	0	3	
Strength of Materials	3	0	3	
Dynamics	3	0	3	
Metallurgy I, II, III	6	6	9	
Circuit Analysis I, II	4	8	12	
Non-Linear Circuits	2	4	6	
Electromechanical Design	0	2	1	
Manufacturing Methods I, II	2	4	4	
Machine Design I	3	3	4	
Measurements	1	2	2	
Measuring Devices	1	2	2	28-31-49
Auxiliary Technical Courses:				
Shop Practices I, II, III	0	9	3	
Technical Drawing I, II, III	0	18	9	
Technical Report Writing	3	0	3	
Electrical Drawings	0	6	2	3-33-17
Mathematics:				
Technical Math I, II, III (including Calculus)	12	0	12	12-0-12
Science:				
Physics I, II, III	9	6	9	9-6-9
General Education:				
Communications I, II	6	0	6	
Psychology	3	0	3	
Business Management/Organ	3	0	3	
Economics	3	0	3	
Physical Education	3	0	3	18-0-18

SUMMARY: (70-70-105)

Technical Courses	49	(32 2/3)	46.7%
Auxiliary Tech Courses	17	(11 1/3)	16.2%
Mathematics	12	(8)	11.4%
Science	9	(6)	8.6%
General Education	18	(12)	17.1%
	105	(70)	100.0%

NOTES: No graduates estimated during 1970.
Accredited by Northwestern Association.

Milwaukee Technical College, Wisconsin

	T	L	C	
Technical Courses:				
Circuit Analysis	2	4	4	
Mechanics	2	4	4	
Electromechanical Devices	1	3	2	
Electromechanical Systems I	1	3	2	
Electronics	2	4	4	
Mechanical Analysis	2	4	4	
Logic Circuits	2	4	4	
Mechanics & Dynamics	2	2	3	
Control Devices	2	2	3	
Electromechanical Systems II	3	3	4	
Electromechanical Design	1	6	3	
Automatic Control Systems	2	4	4	
Electronic Communications	2	4	4	24-47-45
Auxiliary Technical Courses:				
Technical Writing	1	0	1	1-0-1
Mathematics:				
Physical Mathematics	3	0	3	
Math Analysis	3	0	3	6-0-6
Science:				
Physics Concepts	3	2	4	
Applied Physics	3	2	4	6-4-8
General Education:				
Communication Skills I	3	0	3	
Psychology of Human Relations	3	0	3	
American Institutions	3	0	3	
Business and Industrial Relations	3	0	3	
Communications Skills II	3	0	3	15-0-15

SUMMARY: (52-51-75)

Technical Courses	45	60.0%
Auxiliary Tech. Courses	1	1.3%
Mathematics	6	8.0%
Science	8	10.7%
General Education	15	20.0%
	75	100.0%

NOTES: No graduates during 1970 - New program.
Accredited by the North Central Association.

Utah Technical College, Salt Lake City, Utah

	(Quarter Hours)			
Technical Courses:	T	L	C	
DC-AC Applications	0	10	3	
DC-AC Circuit Fundamentals	7	3	8	
Applied Amplifiers	0	10	3	
Solid State Fundamentals	5	3	6	
Applied Communication Devices	0	10	3	
Communication Devices	5	3	6	
Digital/Analog Concepts	0	10	3	
Computer Technology	5	0	5	
Electromechanical Lab I & II	0	20	6	
Mechanisms I & II	10	6	12	32-75-55
Auxiliary Technical Courses:				
Electronic Drafting	2	3	3	
Technical Writing	5	0	5	7-3-8
Mathematics:				
Algebra I,II, & III	9	6	9	
Boolean Algebra	3	2	3	
Differential/Integral Calculus	6	2	6	18-10-18
Science:				
Physics I, II, & III	9	2	9	
Physics IV, V, & VI	9	4	9	18-6-18
General Education:				
Communications	5	0	5	
Industrial Psychology	5	0	5	
Political Science	5	0	5	15-0-15

SUMMARY: (80-94-114)

Technical Courses	55	(36 2/3)	48.2%
Auxiliary Tech. Courses	8	(5 1/3)	7.0%
Mathematics	18	(12)	15.8%
Science	18	(12)	15.8%
General Education	15	(10)	13.2%
	114	(76)	100.0%

NOTES: No graduates during 1970 - new program.
Candidate for accreditation by the Northwest Association.

VITA

Luther Paul Robertson Jr.

Candidate for the Degree of

Doctor of Education

Thesis: AN EVALUATION OF THE ELECTROMECHANICAL TECHNOLOGY CURRICULUM AT OKLAHOMA STATE UNIVERSITY

Major Field: Higher Education

Biographical:

Personal Data: Born in Merigold, Mississippi, August 21, 1922, the son of Mr. and Mrs. Luther Paul Robertson.

Education: Graduated from Merigold High School, Merigold, Mississippi, in 1939; received the Bachelor of Science in Education Degree from Delta State College, Cleveland, Mississippi, in May, 1947, with a major in Mathematics; received the Master of Arts Degree from George Peabody College for Teachers, Nashville, Tennessee, in August, 1951, with a major in Mathematics; attended Centenary College of Louisiana, University of New Mexico, and University of California, Berkeley; completed requirements for the Doctor of Education Degree in July, 1970, at Oklahoma State University.

Professional Experience: Electronics Officer, U. S. Navy, 1941-46; Mathematics Teacher and Athletic Coach, Cleveland High School, Cleveland, Mississippi, 1947-49; Electronics Instructor and Supervisor of Student Teaching, Keesler AFB Technical Schools, Mississippi, 1949-52; Atomic Weapons Field Engineer, Sandia Corporation, New Mexico, 1952-60; Supervisor Instrumentation Systems Design Section, Sandia Laboratories, New Mexico, 1960-67; Educational Staff, Sandia Laboratories, New Mexico, 1967-70; Research Associate (on loan from Sandia), Oklahoma State University, 1968-69.

Professional Organizations: American Society of Engineering Education, Cooperative Education Association, Adult Education Association, National Council of Teachers of Mathematics, and Phi Delta Kappa.