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ABSTRACT

A cooperative demonstration program between industry (General Electric) and education (John Patterson State Technical College, Alabama) designed and conducted a training program and competency assessment for individuals entering high technology positions related to industrial production in Alabama. The program was designed to develop employees as production maintenance technicians. Students entered two associate degree programs--industrial maintenance technology and instrumentation technology. A dissemination workshop was conducted to share the results of the project. Ten program objectives were met: (1) a model curriculum was developed; (2) instruments and procedures for assessing trainees' competencies were devised; (3) the program recruited and assessed the competency of 120 potential trainees; (4) 50 employees completed upgrading training for production maintenance and 30 more were enrolled; (5) 27 maintenance technicians received upgrading training; (6) entry-level training was provided to 51 trainees; (7) student profiles were prepared and annual completer and employer follow-ups were planned to evaluate the program; (8) 71 percent of program completers were placed in positions and follow-up was planned for 3 years; (9) program materials were disseminated; and (10) the model was demonstrated to 54 workshop participants. (The following eight appendices are included: a list of Alabama Industrial Technician Education Cooperative Demonstration Program steering committee members; final external evaluation report; curricula course listings; performance checklist for production maintenance technician; interim third-party evaluation report; industrial technician curriculum workshop outline; schematic mock-up; and project timeline.) (NLA)

FINAL PERFORMANCE REPORT

V199A00051

FUNDED UNDER:

"COOPERATIVE DEMONSTRATION PROGRAM (HIGH TECHNOLOGY)"

TITLE:

ALABAMA INDUSTRIAL TECHNICIAN EDUCATION COOPERATIVE DEMONSTRATION PROGRAM (I-TEC)

SUBMITTED TO:

U.S. DEPARTMENT OF EDUCATION

DECEMBER 1991

SUBMITTED BY:

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ALABAMA INDUSTRIAL TECHNICIAN EDUCATION COOPERATIVE DEMONSTRATION PROGRAM (I-TEC) V199A00051

FINAL REPORT

Intent of Project

The intent of this project was to develop procedures for industry and education to work together to design and conduct a training program along with the development of a competency assessment for individuals entering a number of high tech positions relating to industrial production.

Through contact with local and southeast region industry leadership John M. Patterson State Technical College (J P Tech) determined the need for such a program and also the need for expanding the training opportunities. It was planned as part of the project to make the information, curriculum and data available through a cooperative dissemination effort between local industry and their affiliates and other postsecondary institutions.

The Cooperative Demonstration High Tech program was designed to develop employees as PRODUCTION MAINTENANCE TECHNICIANS. With successful completion of the training program an employee will be competent as a high tech technician with the ability to:

> Inspect, test, adjust and repair electric, electronic, mechanical and pneumatic instruments and systems used to indicate, record and control generating operations. Test, adjust and repair automated equipment incorporating electronic sensing devices that monitor, control or activate mechanical operations. A Production Maintenance Technician may follow blueprints, operate metalworking machines, and use hand tools and precision measuring and testing devices to build instrument housings, install electrical and electronic equipment, and calibrate instruments and machinery, inspect meters, indicators, and gages to detect abnormal fluctuations. Test accuracy of flowmeters, pressure gages, temperature indicators, controllers, radiation counters or detectors, and other recording, indicating or controlling instruments to locate defective components in system, using test equipment, such as pressure gages, mercury manometers, potentiometers, pulse and signal generators, oscilloscopes, transistor curve tracers, and ammeters, voltmeters and wattmeters.

Need for the Project

A major employer in the Montgomery, Alabama area, General Electric Corporation Burkville Plant, realized a need for production maintenance technicians who were skilled in several technologies. These multicrafted individuals were needed to design, develop, maintain, modify, and repair the various technology systems involved in production at the plant.

Management decided that the most expedient way to acquire the multiskilled technicians would be to cross train and upgrade employees who possess basic competencies in some areas but who needed training in other areas to perform in the high technology positions.

Because of previous cooperative endeavors with John M. Patterson State Technical College, management of the G.E. Plant approached Patterson Technical College with the problem. After a series of meetings, job tasks studies, training program reviews and resource assessments, efforts were initiated to respond to the need.

The analyses revealed that (1) a complete curriculum would have to be developed, (2) extensive resources in equipment and training aids would be required, (3) instructional personnel from a number of disciplines would be required, (4) all the training resources could best be assembled and accessed on the campus of the college, (5) the training program would be needed throughout the foreseeable future, (6) a steering committee would be needed to oversee the development and implementation of the program. Efforts to develop the program were initiated.

As these efforts were being initiated two major revelations were made: (1) training of multicrafted technicians was needed throughout the General Electric industry, and (2) a number of other industries in the region, many of which were too small to develop their own training program, had a critical need for multicrafted technicians.

The Steering Committee proposed:

(1) completion of the development of the training program initiated by Patterson State Technical College and General Electric,

(2) utilization of the program to train multicrafted technicians for industry in the region, and

(3) providing a demonstration center for the model training program.

Project Implementation

The Alabama Industrial Technician Education Cooperative Demonstration Program was designed to be implemented as a function of John M. Patterson State Technical college with the guidance and support of industry. The following is a brief summary of the steps taken to implement the project.

Management from the local General Electric plant contacted the college with a problem. The industry needed to upgrade their maintenance personnel and make them skilled in several areas. The plant also needed additional personnel trained for industrial maintenance.

Cooperatively the college and the industry began developing short courses to address personnel deficiencies. Soon it became apparent that a comprehensive program was needed. The college staff also became aware that several industries had needs similar to GE.

The college staff determined to develop a comprehensive program to meet the needs of various industries in the area of production maintenance technicians. A project Steering Committee was formed. The composition of the Steering Committee is presented in Appendix A. The Steering Committee and the college staff developed a proposal for funding from the U.S. Department of Education.

The proposal was approved. Funds available for the project included $494,491.00 from federal funds, $110,964.00 from the college and $250,000.00 from local industries.

The project was staffed and activities initiated in January of 1990. A third-party evaluator was selected through an RFP process. An assessment developer was selected through an RFP process. The final report of the Third Party Evaluator is included as Appendix B.

A program was developed to upgrade current production maintenance personnel. The program was divided into courses which were taught in the time frame requested by the industry. As the curriculum for each course was developed it was made available for teaching.

The industries assigned maintenance personnel to take specific courses. As the courses were taught they were evaluated, adjusted, and modified. The curricula for some courses were modified three times.

The Steering Committee expressed a desire for a program that would prepare non-maintenance persons for the maintenance technician positions. Analysis of the required competencies revealed that one program could not cover all requirements in an associate degree program. A decision was made to design two programs along the job definitions being used by several of the larger industries. The categories were "maintenance mechanics" and "I/E's" (Instrumentation/Electronics). The curriculum for the two programs are indicated in Appendix C.

Students were recruited to enter the two programs "Industrial Maintenance Technology" and "Instrumentation Technology." The programs were taught as other associate degree programs on the campus.

The programs were adjusted and modified based on the experience of teaching the courses and programs. A definite format for the curriculum, the syllabus, the instructional guide and reference materials was developed and followed.

Several industries began sending employees to enroll in the associate degree program. Some companies worked with the college staff to tailor curriculum to meet the specific needs of the industry. These curricula were tailored by selecting from available courses and establishing a set curriculum for that industry. Prerequisites and general education courses were selected and added to the technical courses to develop an associate degree program.

Specialized courses continued to be made available to industries who desired them to upgrade their employees.

The final curriculum was packaged as courses, reference materials and teaching guides. The curriculum was produced on 3.5" computer diskettes for distribution to other colleges and industries.

A dissemination workshop was conducted to share the results of the project. Representatives of technical colleges and community colleges and industries in Alabama, Northwest Florida, Southwest Georgia and Southeast Mississippi were invited to the workshop. Representatives from 29 colleges and 6 industries participated. The 54 participants received copies of the curriculum on computer diskettes. They will also receive copies of the assessment instruments.

Program Objectives and Outcomes

1. Through partnership between technical education institutions and representatives of industry, develop a model curriculum for training of high technology, multicraft, Production Maintenance Technicians.

OBJECTIVE

a. Increase the number of major industries involved in the project from 4 to 10.

OUTCOME

The major industries included in the project included:

American Sterilizer Co.
J.R. Smith Manufacturing Co., Inc.
General Electric
Litton Von Gal
Dana Corporation
Albany International
Webster-Bes-Pak
Jenkins Brick Co.
Thermo King
Kershaw Manufacturing Inc.

OBJECTIVE

b. Refine draft curriculum

OUTCOME

The draft curriculum was tested and refined through a number of steps. The industry specific curriculum was also modified into two regular two-year associate degree programs. Brochures describing those programs are attached as Appendix D.

OBJECTIVE

c. Receive approval of training curriculum from at least twelve (12) industries

OUTCOME

The industries listed in item 1 a. above have approved the training curriculum.

2. Develop instruments and procedures for assessing the competencies of trainees high technology/multicraft occupations to include: electronics, electricity, hydraulics, pneumatics, mechanical and state of the art Process Logic Controls/Computers involved in controlling production processes.

OBJECTIVE

a. Using the Project Steering Committee and industry interviews, develop specific job description of the multicrafted production technician.

OUTCOME

The project staff and the Steering committee adopted the following definition for a Production Maintenance Technician from the U.S. Department of Labor Occupational Outlook Handbook.

An individual employed in a manufacturing facility to: inspect, test, adjust and repair electric, electronic, mechanical and pneumatic instruments and systems used to indicate, record and control generating operations. Test, adjust and repair automated equipment incorporating electronic sensing devices that monitor, control or activate mechanical operations. A Production Maintenance Technician may follow blueprints, operate metalworking machines, and use hand tools and precision measuring and testing devices to build instrument housings, install electrical and electronic equipment, and calibrate instruments and machinery, inspect meters, indicators, and gages to detect abnormal fluctuations. Test accuracy of flowmeters, pressure gages, temperature indicators, controllers, radiation counters or detectors, and other recording, indicating or controlling instruments to locate defective components in system, using test equipment, such as pressure gages, mercury manometers, potentiometers, pulse and signal generators, oscilloscopes, transistor curve tracers, and ammeters, voltmeters and wattmeters. Trace out and tests electronic solid state and vacuum tube circuitry and components to locate defective parts in analog and digital, protection, using test equipment, schematics, and maintenance manuals. Remove defective instruments from system, decontaminate, disassemble, and clean instruments and replace defective parts. Reassemble instruments and replace instruments in system. Lubricate

instruments and replace defective wiring and tubing. Calibrate readings on instruments according to standards and adjust phasing and aline stages to insure accuracy of recording and indicating function. Record, calibrations made, parts and components used, and inventory of parts on hand. Prepare schematic drawings, sketches and reports to reflect changes or alterations made in instruments, circuits and systems.

OBJECTIVE

b. Using task analyses, job descriptions, DACOM techniques, and content analyses ascertain the content for competency assessment of each technology area of the position of production Technician.

OUTCOME

The agency contracted to develop the assessment instruments conducted a DACOM process with 12 industry representatives. The results of the DACOM study produced a matrix of job competencies. The matrix is presented in Appendix E.

OBJECTIVE

c. Design efficient and effective assessment instruments and procedures to assess individuals in any or all of the technology areas specified in the definition of the position of production technician.

OUTCOME

The assessment agency developed assessment instruments and procedures to assess individuals in the various job competencies. The assessment instruments are maintained under test security. Test items may be released to appropriate instructional agencies. To request access to the assessment items contact John M. Patterson State Technical College, 3920 Troy Highway, Montgomery, Alabama 36116.

OBJECTIVE

d. Representatives of ten (10) technical postsecondary programs in the State review all materials and program content and recommend refinements.

OUTCOME

Representatives of postsecondary programs reviewed the materials and procedures as they were developed and made recommendations for refinements.

OBJECTIVE

e. Evaluate the efficiency and effectiveness of the instruments and procedures and revise where needed.

OUTCOME

The procedures and materials were assessed and revisions were made accordingly.

OBJECTIVE

f. Develop and publish 100 copies of the final assessment instruments and procedures handbook.

OUTCOME

100 copies of the assessment instruments and guides have been printed.

OBJECTIVE

g. Design a training program to prepare individuals to implement the competency assessment package.

OUTCOME

The assessment agency conducted training regarding the implementation of the competency assessment package.

OBJECTIVE

h. Conduct the assessment training for fifteen (15) technical college representatives.

OUTCOME

Assessment training for representatives of technical colleges will be conducted upon request.

3. Recruit and assess competency of 250 potential trainees

OBJECTIVE

a. Develop recruitment plan which will identify potential trainees.

OUTCOME

A recruitment plan was developed.

OBJECTIVE

b. Insure under-represented students are served by including contacts with area high schools/vocational centers, employment agencies, and published notices

OUTCOME

Efforts were made to insure that under-represented groups were served.

OBJECTIVE

c. Utilize competency assessment to determine placement stage in program.

OUTCOME

The competency assessment instruments required much longer to develop than anticipated. The competencies of early participants had to be assessed by employers and by teachers after the courses began.

OBJECTIVE

d. Recruit at least 250 students into program.

OUTCOME

The unanticipated recession greatly suppressed the employment opportunities from the program. The fact that the type of training was new to the area also hindered recruitment efforts. Several employers also restricted recruitment opportunities by restricting employment in production maintenance technician positions to individuals already employed with that specific company. As a result, only 120 individuals were recruited into the program.

OBJECTIVE

e. Design and publish 500 copies of a program brochure.

OUTCOME

Four separate brochures related to the program were developed. Over 500 copies of the brochures were made.

OBJECTIVE

f. Utilize multimedia for promotion of program to potential trainees, employers, technical colleges, communities and industry.

OUTCOME

Brochures, flyers, radio ads and posters were utilized to promote the program.

4. Provide training that will upgrade 100 employees from operators level to technicians in the high technology/ multicraft occupations of Production Maintenance Technicians.

OBJECTIVE

a. Curriculum for upgrading of individuals presently employed at the operator level or below in local industry.

OUTCOME

Sections of the curriculum were structured to provide upgrade training to prepare operators to function as production maintenance technicians.

OBJECTIVE

b. Utilize competency assessment to determine placement stage in program.

OUTCOME

The immediate supervisors of the employees provided the competency assessment to determine starting levels for trainees.

OBJECTIVE

c. 100 employees will be trained and upgraded in their present work assignments.

OUTCOME

Fifty individuals completed the upgrade training. Thirty individuals are currently involved in the upgrade training process.

OBJECTIVE

d. Advancement of these employees will create entry level job openings for new employees.

OUTCOME

As these individuals are promoted to maintenance positiors openings for machine operators are being created.

5. Provide training to fifty (50) current "Maintenance Technicians" that will upgrade their current skills and develop new skill technology as a high technology/ multicraft Production Maintenance Technician.

OBJECTIVE

a. Curriculum for upgrading of individuals presently employed in maintenance occupations.

OUTCOME

Sections of the curriculum were selected to provide upgrade training for current maintenance technicians.

OBJECTIVE

b. In addition to upgrading of current skills, curriculum will also be designed to develop new skills, both evaluated by the competency assessment.

OUTCOME

Current skills of maintenance technicians were upgraded and new competencies were developed.

OBJECTIVE

c. Utilize competency assessment to determine placement stage in program.

OUTCOME

The immediate supervisors assessed competency levels of maintenance technicians to determine their training needs.

OBJECTIVE

d. Fifty (50) employees will be trained for upgrading from "Maintenance Technicians" to high technology/ multicraft technicians.

OUTCOME

Twenty-seven maintenance technicians received upgrade training.

6. Provide entry level training to 100 potential high technology/multicraft trainees, recruited from high schools/vocational centers, employment offices, area communities and other industries.

OBJECTIVE

a. Curriculum for training of newly recruited entry level participants.

OUTCOME

The program produced two tracts for training newly recruited entry level participants.

OBJECTIVE

b. Recruitment plan followed to ensure equal access of under-represented groups.

OUTCOME

College recruitment procedures were followed to ensure equal access for under-represented groups.

OBJECTIVE

c. Utilize competency assessment to determine placement in program.

OUTCOME

The College general competency assessment (ACT, ASSET) was utilized to determine beginning placement in the program.

OBJECTIVE

d. 100 potential employees will be trained.

OUTCOME

Fifty-one potertial employees received training, additional ones are being trained.

7. An evaluation plan, along with a timeline, will be utilized to monitor project activities and objective outcomes tracking each student's progress throughout the curriculum.

OBJECTIVE

a. Utilize a student profile to track each student's progress.

OUTCOME

A student profile was used to track the progress of each student in the program.

OBJECTIVE

b. Annual follow-up evaluation by all completers for three (3) years.

OUTCOME

An annual follow-up of completers will be initiated after the initial completers are on the job for one year. The annual follow-up will track program completers for at least three years.

OBJECTIVE

c. Annual follow-up evaluations by employers of completers for three (3) years.

OUTCOME

An annual evaluation of completers by their employers will be initiated after completers have been on the job for one year.

OBJECTIVE

d. Steering Committee and other industry representatives will review competency assessment data and other evaluation data at least once each month to make recommendations for program revisions.

OUTCOME

Craft committee members will review the annual follow-up and employer evaluation data and develop recommendations for program improvement.

OBJECTIVE

e. Utilize timeline and measurable objectives.

OUTCOME

Timelines and measurable objectives were utilized.

OBJECTIVE

f. External consultant will visit campus at least three (3) times and prepare an interim report and a final evaluation.

OUTCOME

An external consultant was contracted to perform a third-party evaluation. The third party evaluator visited the campus several times each quarter and developed an interim report and a final report, which are included as Appendix F and Appendix B.

8. Place 80% of program completers in high technology/ multicraft Production Maintenance Technology positions and provide follow-up for a period of three (3) years.

OBJECTIVE

a. Potential employer contact file will be developed.

OUTCOME

A potential employer contact file is being developed.

OBJECTIVE

b. 80% or 200 of the program completers will be placed in or upgraded to a high technology/multicraft occupation as a result of the training program.

OUTCOME

71% of the participants are currently employed in high technology, multi-craft occupations. Over 80% of those still in training will be placed in high tech multi-craft occupations.

OBJECTIVE

c. Follow-up evaluations will be made on each completer for three (3) years following placement.

OUTCOME

Follow-up evaluations will be made on each completer.

9. Publish program materials and competency assessment data for dissemination to educational institutions, industry and national evaluation study of projects.

OBJECTIVE

a. Assemble and print program materials.

OUTCOME

The curriculum materials have been printed. The curriculum materials have also been recorded on 3.5" computer disks (WordPerfect 5.0).

OBJECTIVE

b. Assemble and print competency assessment package.

OUTCOME

The assessment package has been printed.

OBJECTIVE

c. Disseminate according to plan outlined in Section IX.

OUTCOME

The curriculum materials and assessment materials have been disseminated to 54 representatives of 29 two-year colleges and industries through an on-campus workshop. A copy of the workshop agenda is included as Appendix G. Copies of the final report, the assessment package, and the curriculum are being disseminated to curriculum centers and material instructors and in response to individual requests.

OBJECTIVE

d. Prepare 100 copies for dissemination.

OUTCOME

Over 100 copies of the curriculum on computer disks have been copied. 20 copies of the curriculum have been printed. 100 copies of the assessment have been copied.

10. Demonstrate the model to 100 representatives of technical institutions and industry.

OBJECTIVE

a. In partnership with the Alabama College System conduct an orientation and training workshop for representatives of technical institutions.

b. In partnership with participating industry and Steering Committee conduct an orientation and training workshop for representatives from the Southeast Region industries.

OUTCOME

In cooperation with the Alabama College System and the Project Steering Committee a dissemination workshop for representatives of technical institutions and industries in the region was held. See Appendix G.

OBJECTIVE

c. Provide each representative with a copy of the program materials and competency assessment package.

OUTCOME

Each representative at the Dissemination Workshop received copies of the program materials.

OBJECTIVE

d. 100 total representatives will participate in the two workshops.

OUTCOME

Only 54 representatives attended the workshop, because of proration of educational budgets and travel restrictions. Representatives from other institutions and industries have submitted written requests and will receive copies of the materials.

Required Resources

A. Facilities

The resources of a number of agencies were necessary to implement the project. Members of the I-TEC partnership committed sufficient and appropriate resources to fully implement the program.

John M. Patterson State Technical College provided a facility dedicated to the project. The facility was renovated and modified. The building (4800 square feet) provided offices for the project staff and a large instructional area. The college also provided utilities and furnishings.

B. Equipment

Industries in the area purchased various trainers and provided materials, labor and technical assistance to construct mock-ups of process systems which were used as trainers. Appendix H presented a schematic of one mock-up that was being constructed for the training program. This mock-up involved all valves, controls, sensors, gages, measuring devices and process systems used by the General Electric Burkville plant. The estimated value of the equipment committed by industries to the project exceeded $250,000. Additional training equipment was provided by J P Tech and participating industries.

C. Personnel

Patterson State Technical College provided the Project Director, at 20% of full time, and the Project Coordinator, at 50% of full time. The college also provided administrative support for the project.

The Dean of Instruction for the college served as Project Director and integrated the project operation into the functions of the entire college. The college's Training for Industry coordinator served as Project Coordinator and supported the project with related industry training activities.

Technical assistance for curriculum and program development was provided by industry at approximately three days per month. Industry provided leadership in the form of Steering Committee members as listed in Appendix A. Steering Committee members devoted approximately one day per month to project activities.

Additional personnel required for the project were employed. These personnel included instructors, a curriculum developer, a recruiter/trainee evaluator, and a secretary.

As the project developed, the instructor, the developer and the evaluator all became involved in curriculum development and instruction. Additionally, several part-time instructors were employed to implement the project.

Private Sector Involvement

A. Planning

Industry was significantly involved in planning the project. Continuing involvement in planning is utilizing industry representatives on the project Steering Committee and in other activities.

B. Operation

Industry was involved in implementing the project through (1) representation on the Steering Committee, (2) providing technical assistance in curriculum and program development, (3) providing training equipment, (4) reacting to the proposed curriculum, and (5) evaluating and employing program completers. Specific involvement of the Steering Committee and employers is indicated on the project timeline Appendix I. Commitments of industry to participate in the project activities were obtained prior to initiating the project.

APPENDIX A

ALABAMA INDUSTRIAL TECHNICIAN EDUCATION COOPERATIVE DEMONSTRATION PROGRAM (I-TEC)

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APPENDIX B

FINAL EXTERNAL EVALUATION REPORT

Title of Project:

Industrial Technician Education Cooperative Demonstration Program

Submitted to:

John M. Patterson State Technical College
3920 Troy Highway
Montgomery, Alabama 36116

Submitted by:

James W. Selman Ed.D.
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Date: September 30, 1991

FINAL EXTERNAL EVALUATION

I-TECH PROJECT

John M. Patterson State Technical College (J.P. Tech) in Montgomery, Alabama, has completed an eighteen month Industrial Technician Education Cooperative project. The $800,000. project was jointly funded by the U.S. Department of Education grant ($494,491.), college funds ($110,962), and more than $244,800. in equipment provided by local industry. These funds were used by J.P. Tech to develop and implement a multi-skilled training program to encompass the technologies of electronics, instrumentation, electrical controls, programmable logic controllers, hydraulics, pneumatics, motors, mechanics, welding, pumps, gear boxes, valves, and a variety of drive systems. The program was built upon an academic content core (mathematics, physics, speech, written communications, and psychology) integrated into a core with technical specialty course content.

The external evaluator for the project was Dr. James W. Selman. The external evaluator was selected in response to a RFP distributed to professional educators and agencies known to have expertise in conducting evaluation studies. The evaluator has had no prior appointed association with the College.

During the on-site visits the evaluator and project personnel discussed activity objectives, the level of objective attainment, program strengths and/or weaknesses, and made recommendations for program improvement. Student interviews were conducted by the evaluator during these on-site visits.

Evaluation of the project consisted of both internal and external procedures. Data and information was collected from many sources; college records, steering committee members, employers, students, and program drop-outs. Steering committee members were interview several times during the project to obtain their input and suggestions for program improvement. Employers were contacted by phone to obtain their assessment of the project and the benefits their employees were deriving from their participation. Technicians presently working in maintenance but not participating in the program as students or as employers were interviewed during the DACUM process (Occupational Analysis Workshop). Interim third party evaluation reports of December 1, 1990, April 1, 1991 and the findings included in this final report were discussed with the Dean of Instruction, the project staff, the steering committee, and those in attendance at the dissemination workshop.

II. PROJECT ADMINISTRATION

The Dean of Instruction at J.P.Tech, in consultation with the project coordinator, worked with the steering committee to plan and monitor the project's progress. The steering committee met periodically to provide general coordination, develop and implement project actives, and to assist with internal evaluation. The project staff was responsible for the course content of their teaching areas and worked as a team with the project coordinator in relating their operation to the overall project. Formal and informal meetings were held regularly between the Dean of Instruction, the Project Coordinator, and project staff. Continuous technical assistance and administrative coordination required for planning and implementing the project were maintained by the staff throughout the project.

III. EVALUATION

Purpose: The purpose of the external evaluation was to insure the judicious management of funds and the evaluation of the accomplishments as stated in the objectives of the approved plan of operation included in the grant request. Program evaluation had the following major objectives:

1. Describe the accomplishments of the program, identify those elements of the program that were most effective;

2. Describe the elements of the program that are ineffective and programmatic as well as areas that need modification in the future;

3. Describe the outcomes or the impact of the program services on the participants; and

4. Document how the program environment, activities, and services contributed to the accomplishment or lack of accomplishment of the program goals and objectives.

Evaluation Process:

To obtain information and to collect data the evaluator: conducted on-site visits to classroom and laboratories; conducted interviews (on and off site) with steering committee members , students, teachers, and project staff; and contacted by telephoned employers and program drop-outs. Structured

questions were used to obtain information and to solicit ideas for program improvement from those contacted. Classroom and laboratory observations were used to validate much of the information obtained though the interviewing process.

The evaluation process consisted of two components: (A) Mission Analysis and (B) Function Analysis.

A). Mission Analysis

Objective: To assist the I-TECH staff in improving the operational management plan of the project.

Procedure: The third party evaluator met periodically with the I-TECH staff to provide assistance in establishing, reviewing, organizing and assessing the program's accomplishments in terms of time-line objectives and activities established by the grant. The purpose of these meetings was to improve the planning, management and evaluation activities of the project.

B). Function Analysis

Objective: To evaluate the effectiveness of the project as to;

1). A training program for multi-craft technicians,

2). Existing need of industry as related to multi-craft technician training,

3). Competency of J.P. Tech to provide a multi-craft training program, and

Procedures: The third party evaluator collected data and information by means of;

a) interviews,

b) reviewing curriculum and text materials,

c) observing classes to assess training materials, equipment, and to insure feasibility and ease of training, and

d) reviewing student records.

IV. FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

FINDINGS:

Objective 1. Describe the accomplishments of the program, identify those elements of the program that were most effective;

The I-TEC program developed and tested a multi-crafted technicians program. The program with modifications to meet local training needs can be successfully transported to other colleges and, or states. The curriculum materials and learning experiences provided through the instructional program are of high quality. The curriculum has been placed on computer diskettes to facilitate transportability and modifications needed in other locations. The program was conducted on up-to-date equipment donated by local industries. The support for the program from these industries will continue and most likely expand in the near future. Students and employers are enthusiastic about the program.

This is evidenced by:

1). Financial support from employers for participating employees. All cost (books, supplies, fees) are reimbursed by the employers. Some companies have increased the hourly rate of pay for their employees while they are enrolled in the program and have promised additional hourly increases as soon as the employees complete the program. The quality and quantity of the equipment contributed to-date by local industries also indicates the high

level of acceptance of the program and an expectation of future rewards to be experienced by employers.

2). Students indicate that co-workers are receiving encouragement from their employers to enroll in the program.

3). Steering committee members and engineering societies have made statements that reinforce the belief that a present need does exist for multi-craft maintenance technicians and that this need will increase in the future.

4). The spectrum and diversity of the curriculum was developed to accommodate the maintenance of most industries regardless of size, scope, or process (paper, chemical or manufacturing).

Objective 2 Describe the elements of the program that are ineffective and programmatic as well as areas that need modification in the future;

Overall, the I-TECH program was well designed and developed. The areas that may need modification in the future appear to be limited to the following:

1). Not all of the components identified through the DACUM process are presently included in the curriculum.

2). The DACUM process identified equipment upon which technicians spent maintenance time. This could perhaps, cause programs to underemphasize the importance of a working knowledge of equipment not normally maintained by in-house technicians, but impact the operations of equipment maintained by the in-house maintenance technician (e.g. PLC's). This was not the case with the present project but must be considered when transporting the program to other locations.

Objective 3. Describe the outcomes or the impact of the program services on the participants;

To assess the impact the program was having upon participants, on-site observation visits were made several times each quarter. The visits were always unannounced and time was devoted to interviewing participants (full and part time). Participants were asked questions about program delivery, classroom and laboratory experiences, the practical application of these experiences to on-the-job performance requirements, and were encouraged to identify problems/changes (personal and job related) associated with the program. Content areas that were identified as potential problems for participants were visited many times (physics 1&2).

Students are enthusiastic about the program and the future opportunities for advancement it affords them. Several had received pay increases and were promised additional increases upon completion of the program.

New students often questioned the need for the amount of physics and math included in the curriculum. This reaction, appeared to be more of a question of their perceived ability to pass these courses than the on-the-job value derived from the content. Instructor in the I-TECH program were aware of this concern and related the technical content to on-the-job experiences. Students became convinced that they needed the content and that they could master the content. In final interviews with students that had completed many of those courses, they expressed pleasure with the content and the way these courses were taught.

Contacts made with employers and steering committee members indicated that the project was meeting the training needs of their maintenance departments and would allow them to build upon the labor bases it provided. They were enthusiastic and pleased with the project and its accomplishments.

Objective 4. Document how the program environment, activities, and services contributed to the accomplishment or lack of accomplishment of the program goals and objectives.

The program environment, activities, and services contributed significantly to accomplishing the goals and objectives of the program. The program utilized equipment, procedures, and practices common to the local maintenance needs. The steering committee met regularly and provided much valuable input into the program and the learning experiences. Project staff provided activities and explanations that insured the transition of technical content into practical application for program participants.

CONCLUSIONS:

The external evaluator concludes that at the end of the project:

1). The Industrial Education Cooperative Demonstration Project met all of its objectives;

2). The objectives were met on or before the target dates;

3). Funds were invested and spent wisely in the I-TECH program;

4). The project enabled Patterson Technical College to receive support and opportunities with local industry that would not have been possible in the foreseeable future without this project;

5). Industry now needs and will continue to need highly skilled multi-craft technicians;

6). Industry will support high quality multi-craft maintenance training programs;

7). Pre and Post employed students want, need, and can profit from multi-craft training programs;

8) Curriculum content and learning activities for multi-craft programs need to be developed and updated with input from local industry;

9). Technical core content must be based upon academic course content (math & physics);

10). Theory must be presented in terms of practical application;

11). Instructors in a multi-craft program must have broad academic and technical backgrounds;

RECOMMENDATIONS:

The external evaluator recommends;

1). The progress and program developed at Patterson Technical College under this project be continued, and

2). That additional opportunities to meet the needs of local industry in the Montgomery area be pursued.

APPENDIX C

CURRICULA COURSE LISTINGS

February 1, 1991

CURRICULUM REQUIREMENTS

PRODUCTION MAINTENANCE TECHNICIAN PROGRAM

INSTRUMENTATION TECHNOLOGY (ILT)
ASSOCIATE APPLIED TECHNOLOGY (AAT)

7 QUARTER PROGRAM

	GENERAL EDUCATION CORE COURSES		THEORY HOURS	LAB HOURS	CREDIT HOURS
1.	ORI-100	ORIENTATION TO COLLEGE	1	0	1
2.	MAH-125	TECHNICAL MATHEMATICS	5	0	5
3.	PHC-116	PHYSICS I	3	0	3
4.	PHC-156	PHYSICS I LAB	0	6	2
5.	PHC-117	PHYSICS II	3	0	3
6.	PHC-157	PHYSICS II LAB	0	6	2
7.	COM-101	ENGLISH COMPOSITION I	5	0	5
8.	PSH-270	BUSINESS & INDUSTRIAL PSYCHOLOGY	5	0	5
9.	PLH-206	ETHICS AND SOCIETY	5	0	5
10.	SPC-106	FUNDAMENTALS OF SPEECH COMM.	5	0	5
			32	12	36

	GENERAL OCCUPATIONAL CORE COURSES				
11.	ACR-110	IND. SAFETY, BASIC TOOLS & RIGGING	3	0	3
12.	MTT-213	METALLURGY, FASTENERS & LUBE	3	0	3
13.	ACR-124	ELECTRICAL FUNDAMENTALS	5	0	5
14.	ACR-164	ELECTRICAL FUNDAMENTALS LAB	0	3	1
15.	ACR-123	BASIC PNEUMATICS & HYDRAULICS	3	0	3
16.	ACR-163	BASIC PNEUMATICS & HYDRAULICS LAB	0	3	1
17.	ACR-134	ADV. PNEUMATICS & HYDRAULICS	3	0	3
18.	ACR-174	ADV. PNEUMATICS & HYDRAULICS LAB	0	3	1
			17	9	20

INSTRUMENTATION TECHNOLOGY (ILT)
CURRICULUM REQUIREMENTS

		TECHNICAL SPECIALTY COURSES	THEORY HOURS	LAB HOURS	CREDIT HOURS
19.	ILT-100	BLUEPRINT READING (I-E)	2	0	2
20.	ACR-125	ELECTRICAL MACHINERY & CONTROLS	5	0	5
21.	ACR-165	ELECTRICAL MACHINERY & CONTROLS LAB	0	3	1
22.	ACR-231	BASIC PIPE FITTING & TUBING	3	0	3
23.	ACR-271	BASIC PIPE FITTING & TUBING LAB	0	3	1
24.	ACR-226	ELECTRICAL SYSTEMS	4	0	4
25.	ACR-266	ELECTRICAL SYSTEMS LAB	0	3	1
26.	ACR-227	ELECTRICAL SYSTEMS TROUBLESHOOTING	4	0	4
27.	ACR-267	ELECTRICAL SYSTE 3 TRBLSHTG LAB	0	3	1
28.	ILT-131	SOLID STATE FUNDAMENTALS FOR ELECTRICIANS	5	0	5
29.	ILT-171	SOLID STATE FUNDAMENTALS FOR ELECTRICIANS LAB	0	6	2
30.	ILT-254	ELECTRONICS FOR INDUSTRIAL ELECTRICIANS	5	0	5
31.	ILT-294	ELECTRONICS FOR INDUSTRIAL ELECTRICIANS LAB	0	6	2
32.	ILT-255	PROGRAMMABLE LOGIC CONTROLLERS	4	0	4
33.	ILT-295	PROGRAMMABLE LOGIC CONTROLLERS LAB	0	3	1
34.	ILT-256	AUTOMATED PROCESS CONTROL	4	0	4
35.	ILT-296	AUTOMATED PROCESS CONTROL LAB	0	3	1
36.	ILT-252	INSTRUMENTATION THEORY	4	0	4
37.	ILT-253	INSTRUMENTATION SYSTEMS	3	0	3
38.	ILT-293	INSTRUMENTATION SYSTEMS LAB	0	3	1
			43	33	54

ELECTIVE(S):

1.	___-___	_____	4	0	4
			96	54	114

February 1, 1991

THE ALABAMA COLLEGE SYSTEM
CURRICULUM OUTLINE

COLLEGE PATTERSON
PROGRAM INSTRUMENTATION TECHNOLOGY
DEPARTMENT CODE (ILT) CIP CODE (47.0105)
FORMAL AWARD AAT

	COURSE TITLE	THEORY	LAB	CREDIT HOURS
FIRST QUARTER:				
ORI-100	ORIENTATION TO COLLEGE	1	0	1
MAH-125	TECHNICAL MATHEMATICS	5	0	5
PHC-116	PHYSICS I	3	0	3
PHC-156	PHYSICS I LAB	0	6	2
ACR-110	IND. SAFETY, BASIC TOOLS & RIGGING	3	0	3
MTT-213	METALLURGY, FASTENERS & LUBE	3	0	3
	TOTALS	15	6	17
SECOND QUARTER:				
PHC-117	PHYSICS II	3	0	3
PHC-157	PHYSICS II LAB	0	6	2
ACR-123	BASIC PNEUMATICS & HYDRAULICS	3	0	3
ACR-163	BASIC PNEUMATICS & HYDRAULICS LAB	0	3	1
ACR-124	ELECTRICAL FUNDAMENTALS	5	0	5
ACR-164	ELECTRICAL FUNDAMENTALS LAB	0	3	1
	TOTALS	11	12	15
THIRD QUARTER:				
COM-101	ENGLISH COMPOSITION I	5	0	5
ACR-134	ADV. PNEUMATICS & HYDRAULICS	3	0	3
ACR-174	ADV. PNEUMATICS & HYDRAULICS LAB	0	3	1
ACR-125	ELECTRICAL MACHINERY & CONTROLS	5	0	5
ACR-165	ELECTRICAL MACHINERY & CONTROLS LAB	0	3	1
	TOTALS	13	6	15

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CURRICULUM OUTLINE

	COURSE TITLE	THEORY	LAB	CREDIT HOURS
FOURTH QUARTER:				
ILT-131	SOLID STATE FUNDAMENTALS FOR ELECTRICIANS	5	0	5
ILT-171	SOLID STATE FUNDAMENTALS FOR ELECTRICIANS LAB	0	6	2
ILT-100	BLUEPRINT READING (IE)	2	0	2
PLH-206	ETHICS AND SOCIETY	5	0	5
ACR-231	BASIC PIPE FITTING & TUBING	3	0	3
ACR-271	BASIC PIPE FITTING & TUBING LAB	0	3	1
	TOTALS	15	9	18
FIFTH QUARTER:				
ILT-254	ELECTRONICS FOR INDUSTRIAL ELECTRICIANS	5	0	5
ILT-294	ELECTRONICS FOR INDUSTRIAL ELECTRICIANS LAB	0	6	2
ILT-252	INSTRUMENTATION THEORY	4	0	4
PSH-270	BUSINESS & INDUSTRIAL PSYCHOLOGY	5	0	5
	TOTALS	14	6	16
SIXTH QUARTER:				
ILT-255	PROGRAMMABLE LOGIC CONTROLLERS	4	0	4
ILT-295	PROGRAMMABLE LOGIC CONTROLLERS LAB	0	3	1
ILT-256	AUTOMATED PROCESS CONTROL	4	0	4
ILT-296	AUTOMATED PROCESS CONTROL LAB	0	3	1
ACR-226	ELECTRICAL SYSTEMS	4	0	4
ACR-266	ELECTRICAL SYSTEMS LAB	0	3	1
	TOTALS	12	9	15

February 1, 1991

CURRICULUM OUTLINE

COURSE TITLE		THEORY	LAB	CREDIT HOURS
SEVENTH QUARTER:				
ILT-253	INSTRUMENTATION SYSTEMS	3	0	3
ILT-293	INSTRUMENTATION SYSTEMS LAB	0	3	1
ACR-227	ELECTRICAL SYSTEMS TROUBLESHOOTING	4	0	4
ACR-267	ELECTRICAL SYSTEMS TRBLSHTG LAB	0	3	1
SPC-106	FUNDAMENTALS OF SPEECH COMM.	5	0	5
___-___	ELECTIVE	4	0	4
	TOTALS	16	6	18

GENERAL EDUCATION CORE COURSES	36
GENERAL OCCUPATIONAL CORE COURSES	20
TECHNICAL OCCUPATIONAL CORE COURSES	54
ELECTIVES	4
TOTAL	114

ELECTIVES:

___-___	ELECTIVES	4	0	4
	TOTALS	4	0	4

February 1, 1991

PRODUCTION MAINTENANCE TECHNICIAN PROGRAM

ASSOCIATE APPLIED TECHNOLOGY (AAT)

INSTRUMENTATION TECHNOLOGY (ILT)
AND
INDUSTRIAL MAINTENANCE TECHNOLOGY (ACR)

COURSE DESCRIPTION - ACADEMICS

OCCUPATIONAL/TECHNICAL SPECIALTY COURSES

COURSE TITLE		THEORY	LAB	CREDIT HOURS
ORI-100	ORIENTATION TO COLLEGE	1	0	1

COURSE DESCRIPTION: This course is designed to introduce the beginning student to college life. It provides information regarding what the college expects and what the student should expect from the college. The course also addresses student attitudes and goals.

PREREQUISITES: None

MAH-125	TECHNICAL MATHEMATICS	5	0	5

COURSE DESCRIPTION: This course includes selected topics from algebra, analytic geometry, and trigonometry with emphasis on applications to engineering technology. Topics include variation, determinants, conic sections, exponential and logarithmic functions, vectors, trigonometric functions, and solutions of right triangles.

PREREQUISITES: MAH-091 or an appropriate mathematics placement score.

PHC-116	PHYSICS I	3	0	3

COURSE DESCRIPTION: This is the first course in a two-course series which provides a study of the concepts, theories and principles of physics and their application to practical problem solving. Topics included are: force, work, rate, momentum, resistance, power, with respect to the systems of mechanics, fluid, electrical, and temperature. Laboratory is required.

PREREQUISITES: MAH-125 or taken concurrently or equivalent.

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COURSE DESCRIPTIONS

COURSE TITLE	THEORY	LAB	CREDIT HOURS
PHC-156 PHYSICS I LAB	0	6	2

COURSE DESCRIPTION: Practical application of theory learned in PHC-116.

PREREQUISITES: PHC-116 or taken concurrently.

PHC-117 PHYSICS II	3	0	3

COURSE DESCRIPTION: This is the second course in a two-course series which provides a study of the concepts, theories and principles of physics and their application to practical problem solving. Specific topics included are: potential and kinetic energy, and force transformers, energy converters, transducers, vibrations and waves, time constants, and radiation, with respect to the systems of mechanics, fluid, electrical, and temperature. Laboratory is required.

PREREQUISITES: PHC-116/156

PHC-157 PHYSICS II LAB	0	6	2

COURSE DESCRIPTION: Practical application of theory learned in PHC-117.

PREREQUISITES: PHC-117 or taken concurrently.

COM-101 ENGLISH COMPOSITION I	5	0	5

COURSE DESCRIPTION: A major writing course, COM 101 includes instruction and frequent practice in developing paragraphs and essays, with emphasis on both composing process and final document.

PREREQUISITES: COM-090 or satisfactory score on English placement test or equivalent.

PSH-270 BUSINESS AND INDUSTRIAL PSYCHOLOGY	5	0	5

COURSE DESCRIPTION: This course is a study of interpersonal relations in the working environment, interpersonal communications, and techniques for selection and supervision of personnel.

PREREQUISITES: None

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COURSE DESCRIPTIONS

COURSE TITLE		THEORY	LAB	CREDIT HOURS
PLH-206	ETHICS AND SOCIETY	5	0	5

COURSE DESCRIPTION: This course is a systematic study of ethical systems as they apply to present-day living.

PREREQUISITES: None

SPC-106	FUNDAMENTALS OF SPEECH COMMUNICATION	5	0	5

COURSE DESCRIPTION: This performance course includes study of the principles of human communication: interpersonal, intrapersonal, and public. It surveys current communication theory and provides practical application.

PREREQUISITES: None

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PRODUCTION MAINTENANCE TECHNICIAN PROGRAM

ASSOCIATE APPLIED TECHNOLOGY (AAT)
INSTRUMENTATION TECHNOLOGY (ILT)

COURSE DESCRIPTIONS
OCCUPATIONAL/TECHNICAL SPECIALTY COURSES

COURSE TITLE		THEORY	LAB	CREDIT HOURS
ACR-110	INDUSTRIAL SAFETY, BASIC TOOLS & RIGGING	3	0	3

COURSE DESCRIPTION: This course covers general safety procedures. Topics included are: personal protection equipment, work area safety, tool safety, and material handling, electrical, welding and cutting, hazardous materials, fire prevention/fighting, ladder/scaffold, complex and heavy rigging.

PREREQUISITES: None

MTT-213	METALLURGY, FASTENERS & LUBRICATION	3	0	3

COURSE DESCRIPTION: This course introduces the student to terminology related to the mechanical, physical, and chemical properties of metal, testing methods, tools, various types of alloys, fasteners and lubrication.

PREREQUISITES: None

ACR-124	ELECTRICAL FUNDAMENTALS	5	0	5

COURSE DESCRIPTION: This course introduces the fundamentals of electricity, Ohm's Law, DC series and parallel circuits, circuit symbols, diagrams, basic measuring devices, and batteries. It also includes instruction on magnets, electro-magnetism, basic DC motors, basic wiring of bell and lighting circuits, wiring materials and control circuits. This course also introduces fundamentals of AC circuits including AC test equipment, inductive and capacitive circuits, RL and RC series and parallel circuits, AC power, power factor and single phase, 3-wire service.

PREREQUISITES: MAH-125 and PHC-116/156 or taken concurrently.

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COURSE DESCRIPTIONS

COURSE TITLE	THEORY	LAB	CREDIT HOURS
ACR-164 ELECTRICAL FUNDAMENTALS LAB	0	3	1

COURSE DESCRIPTION: Practical application of theory learned in . ` -124.

PREREQUISITES: ACR-124 or taken concurrently.

ACR-123 BASIC PNEUMATICS & HYDRAULICS	3	0	3

COURSE DESCRIPTION: This is a beginning course designed to aquaint the student with the basics of fluid power and control. Topics included are: basic formulas that demonstrate the physics of fluid power; symbols and schematic diagrams of basic circuits; basic functions of hydraulic and pneumatic components, and the synergistic effect created by applying these principles together on a trainer in laboratory experiments.

PREREQUISITES: PHC-116/156 or taken concurrently.

ACR-163 BASIC PNEUMATICS & HYDRAULICS LAB	0	3	1

COURSE DESCRIPTION: Practical application of theory learned in ACR-123.

PREREQUISITES: ACR-123 or taken concurrently.

ACR-134 ADV. PNEUMATICS & HYDRAULICS	3	0	3

COURSE DESCRIPTION: This is a course designed to take the student beyond the basics of hydraulics and pneumatics and into the advanced maintenance working knowledge of confined pressurized fluid. Topics included are: complex schematic reading; maintenance concepts of analysis and repair; breakdown and buildup of pumps, motors, cylinders and valves, and the synergistic effect of putting circuits into operation using trainers and mock-ups.

PREREQUISITES: ACR-123/163

February 1, 1991

COURSE DESCRIPTIONS

COURSE TITLE		THEORY	LAB	CREDIT HOURS
ACR-174	ADV. PNEUMATICS & HYDRAULICS LAB	0	3	1

COURSE DESCRIPTION: Practical application of theory learned in ACR-134.

PREREQUISITES: ACR-134 or taken concurrently.

ILT-100	BLUEPRINT READING FOR INSTRUMENTATION	2	0	2

COURSE DESCRIPTION: This course introduces basic symbols, abbreviations and structural shapes used on blueprints, schematics, and assembly drawings, piping and instrumentation drawings for the instrumentation technician.

PREREQUISITES: ACR-124/164

ACR-231	BASIC PIPE FITTING & TUBING	3	0	3

COURSE DESCRIPTION: This course is designed to introduce piping installation and design of piping systems to help the job-entry level technician attain basic skills related to metallic and non-metallic piping materials, pipe fittings, cutting and threading piping, tubing and related components in the systems.

PREREQUISITES: MAH-125 and MTT-213

ACR-271	BASIC PIPE FITTING & TUBING LAB	0	3	1

COURSE DESCRIPTION: Practical application of theory learned in ACR-231.

PREREQUISITES: ACR-231 or taken concurrently.

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COURSE DESCRIPTIONS

COURSE TITLE	THEORY	LAB	CREDIT HOURS
ACR-125 ELECTRICAL MACHINERY & CONTROLS	5	0	5

COURSE DESCRIPTION: This course includes a review of Ac circuit principles, operation and installation of fluorescent lighting systems, introduction to the National Electrical Code, operating principles and control of DC motors and generators, introduction to polyphase circuits and transformers, 3-phase motors and alternators, controllers, and motor maintenance.

PREREQUISITES: ACR-124/164

ACR-165 ELECTRICAL MACHINERY & CONTROLS LAB	0	3	1

COURSE DESCRIPTION: Practical application of theory learned in ACR-125.

PREREQUISITES: ACR-125 or taken concurrently.

ACR-226 ELECTRICAL SYSTEMS	4	0	4

COURSE DESCRIPTION: This course covers conduit installation, lighting panels and sealed fittings, installation of panel devices, megging and grounding systems, transformer and control panel hook-up, and troubleshooting of lighting systems. Also, raceway wiring, bus systems, wire and cable splice, installation of switch gear, motors, generators, motor pre-start and maintenance and control circuits.

PREREQUISITES: ACR-124/164 and ACR-125/165 or taken concurrently.

ACR-266 ELECTRICAL SYSTEMS LAB	0	3	1

COURSE DESCRIPTION: Practical application of theory learned in ACR-226.

PREREQUISITES: ACR-226 or taken concurrently.

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COURSE DESCRIPTIONS

COURSE TITLE	THEORY	LAB	CREDIT HOURS
ACR-227 ELECTRICAL SYSTEMS TROUBLESHOOTING	4	0	4

COURSE DESCRIPTION: This course includes troubleshooting safety practices, techniques for troubleshooting industrial equipment to include: cranes & hoists, welding machines, electric lift equipment, material handling equipment, air compressors, hydraulically operated equipment, brake press, lathes, drill press, grinders, milling/boring machines, numerical control and computer numerical control machines.

PREREQUISITES: ACR-226/266

ACR-267 ELECTRICAL SYSTEMS TROUBLESHOOTING LAB	0	3	1

COURSE DESCRIPTION: Practical application of theory learned in ACR-227.

PREREQUISITES: ACR-227 or taken concurrently.

ILT-131 SOLID STATE FUNDAMENTALS FOR ELECTRICIANS	5	0	5

COURSE DESCRIPTION: This course presents a comprehensive overview of solid state devices and systems, including diodes, SCR's, transistsors, triacs, diacs, UJTs, FETs, Integrated circuits, amplifiers, fiber optics, and light-activated components.

PREREQUISITES: ACR-124/164

ILT-171 SOLID STATE FUND. FOR ELECTRICIANS LAB	0	6	2

COURSE DESCRIPTION: Practical application of theory learned in ILT-131.

PREREQUISITES: ILT-131 or taken concurrently.

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COURSE DESCRIPTIONS

COURSE TITLE	THEORY	LAB	CREDIT HOURS
ILT-254 ELECTRONICS FOR INDUSTRIAL ELECTRICIANS	5	0	5

COURSE DESCRIPTION: This course emphasizes the theory and principles of industrial electronics, electronic devices, components, and circuits used widely in the industry.

PREREQUISITES: ACR-131/171

ILT-294 ELECTRONICS FOR INDUSTRIAL ELECTRICIANS LAB	0	6	2

COURSE DESCRIPTION: Practical application of theory learned in ILT-241.

PREREQUISITES: ILT-254 or taken concurrently.

ILT-255 PROGRAMMABLE LOGIC CONTROLLERS	4	0	4

COURSE DESCRIPTION: A study of programmable logic controller application and operation, programming procedures, fault isolation procedures and methods of entering, executing, debugging, and changing programs.

PREREQUISITES: ILT-254/294

ILT-295 PROGRAMMABLE LOGIC CONTROLLERS LAB	0	3	1

COURSE DESCRIPTION: Practical application of theory learned in ILT-242.

PREREQUISITES: ILT-255 or taken concurrently.

ILT-256 AUTOMATED PROCESS CONTROL	4	0	4

COURSE DESCRIPTION: This course provides the fundamentals of industrial electronic control, robotics, transducers, signal processing, feedback loops, analog, and digital controllers.

PREREQUISITES: ILT-254/294 and ILT-255/295 or taken concurrently.

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COURSE DESCRIPTIONS

COURSE TITLE	THEORY	LAB	CREDIT HOURS
ILT-296 AUTOMATED PROCESS CONTROL LAB	0	3	1

COURSE DESCRIPTION: Practical application of theory learned in ILT-243.

PREREQUISITES: ILT-256 or taken concurrently.

ILT-252 INSTRUMENTATION THEORY	4	0	4

COURSE DESCRIPTION: This course introduces the student to the basic theory and principles of instrumentation, various instruments employed in industrial applications, and examples of the actual application of instruments used in process control.

PREREQUISITES: ILT-100 and ILT-254/294

ILT-253 INSTRUMENTATION SYSTEMS	3	0	3

COURSE DESCRIPTION: This course introduces the student to various fields of process measurement; feedback control systems; process/pressure measuring instruments; actuators and valves; simulators, leak testing, instrumentation piping systems, trays, and system start-up procedures.

PREREQUISITES: ILT-252

ILT-293 INSTRUMENTATION SYSTEMS LAB	0	3	1

COURSE DESCRIPTION: Practical application of theory learned in ILT-253.

PREREQUISITES: ILT-253 or taken concurrently.

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CURRICULUM REQUIREMENTS

PRODUCTION MAINTENANCE TECHNICIAN PROGRAM

INDUSTRIAL MAINTENANCE TECHNOLOGY (ACR)
ASSOCIATE APPLIED TECHNOLOGY (AAT)

7 QUARTER PROGRAM

	GENERAL EDUCATION CORE COURSES		THEORY HOURS	LAB HOURS	CREDIT HOURS
1.	ORI-100	ORIENTATION TO COLLEGE	1	0	1
2.	MAH-125	TECHNICAL MATHEMATICS	5	0	5
3.	PHC-116	PHYSICS I	3	0	3
4.	PHC-156	PHYSICS I LAB	0	6	2
5.	PHC-117	PHYSICS II	3	0	3
6.	PHC-157	PHYSICS II LAB	0	6	2
7.	COM-101	ENGLISH COMPOSITION I	5	0	5
8.	PSH-270	BUSINESS & INDUSTRIAL PSYCHOLOGY	5	0	5
9.	PLH-206	ETHICS AND SOCIETY	5	0	5
10.	SPC-106	FUNDAMENTALS OF SPEECH COMM.	5	0	5
			32	12	36

	GENERAL OCCUPATIONAL CORE COURSES				
11.	ACR-110	IND. SAFETY, BASIC TOOLS & RIGGING	3	0	3
12.	MTT-213	METALLURGY, FASTENERS & LUBE	3	0	3
13.	ACR-124	ELECTRICAL FUNDAMENTALS	5	0	5
14.	ACR-164	ELECTRICAL FUNDAMENTALS LAB	0	3	1
15.	ACR-123	BASIC PNEUMATICS & HYDRAULICS	3	0	3
16.	ACR-163	BASIC PNEUMATICS & HYDRAULICS LAB	0	3	1
17.	ACR-134	ADV. PNEUMATICS & HYDRAULICS	3	0	3
18.	ACR-174	ADV. PNEUMATICS & HYDRAULICS LAB	0	3	1
			17	9	20

INDUSTRIAL MAINTENANCE TECHNOLOGY (ACR)
CURRICULUM REQUIREMENTS

	TECHNICAL SPECIALTY COURSES		THEORY HOURS	LAB HOURS	CREDIT HOURS
19.	MTT-113	BLUEPRINT I	3	0	3
20.	MTT-114	WELDING & PIPEFTG BLUEPRINT READING	3	0	3
21.	WDT-147	WELDING I	3	0	3
22.	WDT-187	WELDING I LAB	0	12	4
23.	WDT-242	WELDING II	3	0	3
24.	WDT-282	WELDING II LAB	0	12	4
25.	ACR-231	BASIC PIPE FITTING & TUBING	3	0	3
26.	ACR-271	BASIC PIPE FITTING & TUBING LAB	0	3	1
27.	ACR-232	SCREW PIPE & TUBING ASSEMBLIES	3	0	3
28.	ACR-272	SCREW PIPE & TUBING ASSEMBLIES LAB	0	3	1
29.	ACR-233	PIPE FABRICATION	3	0	3
30.	ACR-273	PIPE FABRICATION LAB	0	6	2
31.	ACR-253	DRIVE SYSTEMS & BEARINGS	3	0	3
32.	ACR-293	DRIVE SYSTEMS & BEARINGS LAB	0	3	1
33.	ACR-254	PUMPS & COMPRESSORS	3	0	3
34.	ACR-294	PUMPS & COMPRESSORS LAB	0	3	1
35.	ACR-255	MECHANICAL SYSTEMS & BOILERS	3	0	3
			30	42	44
ELECTIVE(S):					
1.	___-___	_____	14	0	14
			93	63	114

February 1, 1991

THE ALABAMA COLLEGE SYSTEM
CURRICULUM OUTLINE

COLLEGE PATTERSON
PROGRAM INDUSTRIAL MAINTENANCE
DEPARTMENT CODE (ACR) CIP CODE (47.0201)
FORMAL AWARD AAT

COURSE TITLE		THEORY	LAB	CREDIT HOURS
FIRST QUARTER:				
ORI-100	ORIENTATION TO COLLEGE	1	0	1
MAH-125	TECHNICAL MATHEMATICS	5	0	5
PHC-116	PHYSICS I	3	0	3
PHC-156	PHYSICS I LAB	0	6	2
ACR-110	IND. SAFETY, BASIC TOOLS & RIGGING	3	0	3
MTT-213	METALLURGY, FASTENERS & LUBE	3	0	3
MTT-113	BLUEPRINT I	3	0	3
	TOTALS	18	6	20
SECOND QUARTER:				
PHC-117	PHYSICS II	3	0	3
PHC-157	PHYSICS II LAB	0	6	2
ACR-124	ELECTRICAL FUNDAMENTALS	5	0	5
ACR-164	ELECTRICAL FUNDAMENTALS LAB	0	3	1
ACR-123	BASIC PNEUMATICS & HYDRAULICS	3	0	3
ACR-163	BASIC PNEUMATICS & HYDRAULICS LAB	0	3	1
	TOTALS	11	12	15
THIRD QUARTER:				
COM-101	ENGLISH COMPOSITION I	5	0	5
ACR-134	ADV. PNEUMATICS & HYDRAULICS	3	0	3
ACR-174	ADV. PNEUMATICS & HYDRAULICS LAB	0	3	1
MTT-114	WLDG & PIPFTG BLUEPRINT READING	3	0	3
___-___	ELECTIVE	3	0	3
	TOTALS	14	3	15

February 1, 1991

CURRICULUM OUTLINE

	COURSE TITLE	THEORY	LAB	CREDIT HOURS
	FOURTH QUARTER:			
WDT-147	WELDING I	3	0	3
WDT-187	WELDING I LAB	0	12	4
ACR-231	BASIC PIPE FITTING & TUBING	3	0	3
ACR-271	BASIC PIPE FITTING & TUBING LAB	0	3	1
___-___	ELECTIVE	5	0	5
	TOTALS	11	15	16
	FIFTH QUARTER:			
ACR-253	DRIVE SYSTEMS & BEARINGS	3	0	3
ACR-293	DRIVE SYSTEMS & BEARINGS LAB	0	3	1
WDT-242	WELDING II	3	0	3
WDT-282	WELDING II LAB	0	12	4
ACR-232	SCREW PIPE & TUBING ASSEMBLIES	3	0	3
ACR-272	SCREW PIPE & TUBING ASSEMBLIES LAB	0	3	1
	TOTALS	9	18	15
	SIXTH QUARTER:			
PSH-270	BUSINESS & INDUSTRIAL PSYCHOLOGY	5	0	5
ACR-233	PIPE FABRICATION	3	0	3
ACR-273	PIPE FABRICATION LAB	0	6	2
ACR-254	PUMPS & COMPRESSORS	3	0	3
ACR-294	PUMPS & COMPRESSORS LAB	0	3	1
___-___	ELECTIVE	3	0	3
	TOTALS	14	9	17

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CURRICULUM OUTLINE

COURSE TITLE		THEORY	LAB	CREDIT HOURS
SEVENTH QUARTER:				
PLH-206	ETHICS AND SOCIETY	5	0	5
ACR-255	MECHANICAL SYSTEMS & BOILERS	3	0	3
SPC-106	FUNDAMENTALS OF SPEECH COMM.	5	0	5
___-___	ELECTIVE	3	0	3
	TOTALS	16	0	16

GENERAL EDUCATION CORE COURSES	36
OCCUPATIONAL CORE COURSES	20
TECHNICAL SPECIALTY CORE COURSES	44
FREE ELECTIVES	14
TOTAL	114

ELECTIVES:				
___-___	ELECTIVES	14	0	14
	TOTALS	14	0	14

February 1, 1991

PRODUCTION MAINTENANCE TECHNICIAN PROGRAM

ASSOCIATE APPLIED TECHNOLOGY (AAT)

INSTRUMENTATION TECHNOLOGY (ILT)
AND
INDUSTRIAL MAINTENANCE TECHNOLOGY (ACR)

COURSE DESCRIPTION - ACADEMICS

OCCUPATIONAL/TECHNICAL SPECIALTY COURSES

COURSE TITLE	THEORY	LAB	CREDIT HOURS
ORI-100 .ORIENTATION TO COLLEGE	1	0	1

COURSE DESCRIPTION: This course is designed to introduce the beginning student to college life. It provides information regarding what the college expects and what the student should expect from the college. The course also addresses student attitudes and goals.

PREREQUISITES: None

MAH-125 TECHNICAL MATHEMATICS	5	0	5

COURSE DESCRIPTION: This course includes selected topics from algebra, analytic geometry, and trigonometry with emphasis on applications to engineering technology. Topics include variation, determinants, conic sections, exponential and logarithmic functions, vectors, trigonometric functions, and solutions of right triangles.

PREREQUISITES: MAH-091 or an appropriate mathematics placement score.

PHC-116 PHYSICS I	3	0	3

COURSE DESCRIPTION: This is the first course in a two-course series which provides a study of the concepts, theories and principles of physics and their application to practical problem solving. Topics included are: force, work, rate, momentum, resistance, power, with respect to the systems of mechanics, fluid, electrical, and temperature. Laboratory is required.

PREREQUISITES: MAH-125 or taken concurrently or equivalent.

COURSE DESCRIPTIONS

	COURSE TITLE	THEORY	LAB	CREDIT HOURS
PHC-156	PHYSICS I LAB	0	6	2

COURSE DESCRIPTION: Practical application of theory learned in PHC-116.

PREREQUISITES: PHC-116 or taken concurrently.

PHC-117	PHYSICS II	3	0	3

COURSE DESCRIPTION: This is the second course in a two-course series which provides a study of the concepts, theories and principles of physics and their application to practical problem solving. Specific topics included are: potential and kinetic energy, and force transformers, energy converters, transducers, vibrations and waves, time constants, and radiation, with respect to the systems of mechanics, fluid, electrical, and temperature. Laboratory is required.

PREREQUISITES: PHC-116/156

PHC-157	PHYSICS II LAB	0	6	2

COURSE DESCRIPTION: Practical application of theory learned in PHC-117.

PREREQUISITES: PHC-117 or taken concurrently.

COM-101	ENGLISH COMPOSITION I	5	0	5

COURSE DESCRIPTION: A major writing course, COM 101 includes instruction and frequent practice in developing paragraphs and essays, with emphasis on both composing process and final document.

PREREQUISITES: COM-090 or satisfactory score on English placement test or equivalent.

PSH-270	BUSINESS AND INDUSTRIAL PSYCHOLOGY	5	0	5

COURSE DESCRIPTION: This course is a study of interpersonal relations in the working environment, interpersonal communications, and techniques for selection and supervision of personnel.

PREREQUISITES: None

February 1, 1991

COURSE DESCRIPTIONS

COURSE TITLE		THEORY	LAB	CREDIT HOURS
PLH-206	ETHICS AND SOCIETY	5	0	5

COURSE DESCRIPTION: This course is a systematic study of ethical systems as they apply to present-day living.

PREREQUISITES: None

SPC-106	FUNDAMENTALS OF SPEECH COMMUNICATION	5	0	5

COURSE DESCRIPTION: This performance course includes study of the principles of human communication: interpersonal, intrapersonal, and public. It surveys current communication theory and provides practical application.

PREREQUISITES: None

February 1, 1991

PRODUCTION MAINTENANCE TECHNICIAN PROGRAM

ASSOCIATE APPLIED TECHNOLOGY (AAT)
INDUSTRIAL MAINTENANCE TECHNOLOGY (ACR)

COURSE DESCRIPTIONS

OCCUPATIONAL/TECHNICAL SPECIALTY COURSES

	COURSE TITLE	THEORY	LAB	CREDIT HOURS
ACR-110	INDUSTRIAL SAFETY, BASIC TOOLS & RIGGING	3	0	3

COURSE DESCRIPTION: This course covers general safety procedures. Topics included are: personal protection equipment, work area safety, tool safety, and material handling, electrical, welding and cutting, hazardous materials, fire prevention/fighting, ladder/scaffold, complex and heavy rigging.

PREREQUISITES: None

MTT-213	METALLURGY, FASTENERS & LUBRICATION	3	0	3

COURSE DESCRIPTION: This course introduces the student to terminology related to the mechanical, physical, and chemical properties of metal, testing methods, tools, various types of alloys, fasteners and lubrication.

PREREQUISITES: None

ACR-124	ELECTRICAL FUNDAMENTALS	5	0	5

COURSE DESCRIPTION: This course introduces the fundamentals of electricity, Ohm's Law, DC series and parallel circuits, circuit symbols, diagrams, basic measuring devices, and batteries. It also includes instruction on magents, electro-magnetism, basic DC motors, basic wiring of bell and lighting circuits, wiring materials and control circuits. This course also introduces fundamentals of AC circuits including AC test eqiupment, inductive and capacitive circuits, RL and RC series and parallel circuits, AC power, power factor and single phase, 3-wire service.

PREREQUISITES: MAH-125 and PHC-116/156 or taken concurrently.

February 1, 1991

COURSE DESCRIPTIONS

COURSE TITLE	THEORY	LAB	CREDIT HOURS
ACR-164 ELECTRICAL FUNDAMENTALS LAB	0	3	1

COURSE DESCRIPTION: Practical application of theory learned in ACR-124.

PREREQUISITES: ACR-124 or taken concurrently.

ACR-123 BASIC PNEUMATICS & HYDRAULICS	3	0	3

COURSE DESCRIPTION: This is a beginning course designed to aquaint the student with the basics of fluid power and control. Topics included are: basic formulas that demonstrate the physics of fluid power; symbols and schematic diagrams of basic circuits; basic functions of hydraulic and pneumatic components, and the synergistic effect created by applying these principles together on a trainer in laboratory experiments.

PREREQUISITES: PHC-116/156 or taken concurrently.

ACR-163 BASIC PNEUMATICS & HYDRAULICS LAB	0	3	1

COURSE DESCRIPTION: Practical application of theory learned in ACR-123.

PREREQUISITES: ACR-123 or taken concurrently.

ACR-134 ADVANCED PNEUMATICS & HYDRAULICS	3	0	3

COURSE DESCRIPTION: This is a course designed to take the student beyond the basics of hydraulics and pneumatics and into the advanced maintenance working knowledge of confined pressurized fluid. Topics included are: complex schematic reading; maintenance concepts of analysis and repair; breakdown and buildup of pumps, motors, cylinders and valves, and the synergistic effect of putting circuits into operation using trainers and mock-ups.

PREREQUISITES: ACR-123/163

ACR-174 ADVANCED PNEUMATICS & HYDRAULICS LAB	0	3	1

COURSE DESCRIPTION: Practical application of theory learned in ACR-134.

PREREQUISITES: ACR-134 or taken concurrently.

February 1, 1991

COURSE DESCRIPTIONS

COURSE TITLE		THEORY	LAB	CREDIT HOURS
MTT-113	BLUEPRINT I	3	0	3

COURSE DESCRIPTION: This course is designed to introduce the student to areas of views, lines, projections, dimensions, tolerances, metrics, sections, and some basic machining symbols.

PREREQUISITES: None

MTT-114	WELDING & PIPEFITTING BLUEPRINT READING	3	0	3

COURSE DESCRIPTION: In this course, the student gets a continuation of blueprint reading with special emphasis on welding and pipefitting blueprint interpretations.

PREREQUISITES: MTT-113

WDT-147	WELDING I	3	0	3

COURSE DESCRIPTION: This course introduces welding, safety, oxy-fuel cutting, flat, horizontal, vertical and overhead fillet welds with 6010 and 7018 (SMAW) rods.

PREREQUISITES: MTT-213 & MTT-114 or taken concurrently.

WDT-187	WELDING I LAB	0	12	4

COURSE DESCRIPTION: Practical application of theory learned in WDT-141.

PREREQUISITES: WDT-147 or taken concurrently.

WDT-242	WELDING II	3	0	3

COURSE DESCRIPTION: This course gives an orientation to (GTAW) theory and safety, the procedure to tack and bead stainless steel, carbon, and aluminum, flat, horizontal and vertical fillet welds. Also, an introduction to advanced OA pipe cutting and carbon pipe, horizontal and vertical welds.

PREREQUISITES: WDT-147/187

COURSE DESCRIPTIONS

COURSE TITLE	THEORY	LAB	CREDIT HOURS
WDT-282 WELDING II LAB	0	12	4

COURSE DESCRIPTION: Practical application of theory learned in WDT-242.

PREREQUISITES: WDT-242 or taken concurrently.

ACR-231 BASIC PIPE FITTING & TUBING	3	0	3

COURSE DESCRIPTION: This course is designed to introduce piping installation and design of piping systems to help the job-entry level technician attain basic skills related to metallic and non-metallic piping materials, pipe fittings, cutting and threading piping, tubing and related components in the systems.

PREREQUISITES: MAH-125 and MTT-213

ACR-271 BASIC PIPE FITTING & TUBING LAB	0	3	1

COURSE DESCRIPTION: Practical application of theory learned in ACR-231.

PREREQUISITES: ACR-231 or taken concurrently.

ACR-232 SCREW PIPE & TUBING ASSEMBLIES	3	0	3

COURSE DESCRIPTION: In this course, the student is introduced to the design and fabrication of components & sub-assemblies. Also, valves, traps, strainers, heat tracers, screw pipe and tubing assemblies are fabricated.

PREREQUISITES: ACR-231/271

ACR-272 SCREW PIPE & TUBING ASSEMBLIES LAB	0	3	1

COURSE DESCRIPTION: Practical application of theory learned in ACR-232.

PREREQUISITES: ACR-232 or taken concurrently.

February 1, 1991

COURSE DESCRIPTIONS

COURSE TITLE	THEORY	LAB	CREDIT HOURS
ACR-233 PIPE FABRICATION	3	0	3

COURSE DESCRIPTION: This course introduces the basics of cutting and fabricating seamless and welded pipe.

PREREQUISITES: ACR-232/272 or taken concurrently.

ACR-273 PIPE FABRICATION LAB	0	6	2

COURSE DESCRIPTION: Practical application of theory learned in ACR-233.

PREREQUISITES: ACR-233 or taken concurrently.

ACR-253 DRIVE SYSTEMS & BEARINGS	3	0	3

COURSE DESCRIPTION: This course includes basics related to power transmission, V-bells, flat belts, chain drives, shaft couplings, alignment, bearings, structural steel, equipment installation, foundation formation, and blacksmithing.

PREREQUISITES: MTT-213

ACR-293 DRIVE SYSTEMS & BEARINGS LAB	0	3	1

COURSE DESCRIPTION: Practical application of theory learned in ACR-233.

PREREQUISITES: ACR-253 or taken concurrently.

ACR-254 PUMPS & COMPRESSORS	3	0	3

COURSE DESCRIPTION: In this course the student is introduced to packing, seals, pumps & compressors.

PREREQUISITES: MTT-213

February 1, 1991

COURSE DESCRIPTIONS

COURSE TITLE		THEORY	LAB	CREDIT HOURS
ACR-294	PUMPS & COMPRESSORS LAB	0	3	1

COURSE DESCRIPTION: Practical application of theory learned in ACR-254.

PREREQUISITES: ACR-254 or taken concurrently.

ACR-255	MECHANICAL SYSTEMS & BOILERS	3	0	3

COURSE DESCRIPTION: This course covers the introduction and basic maintenance techniques associated with rotary valves, diverter valves, conveyors and boilers.

PREREQUISITES: ACR-253/293 or taken concurrently.

APPENDIX D

PROJECT BROCHURES

(Not included)

APPENDIX E

PERFORMANCE CHECKLIST FOR PRODUCTION MAINTENANCE TECHNICIAN

MAINTENANCE SYSTEM: ELECTRICAL POWER

Instructor Directions to Trainee:

When I tell you to begin, you are to test the ELECTRICAL POWER SYSTEM in a logical order for this system's condition. I will describe the general conditions and provide tools and equipment to perform this task. Before starting, I will answer any questions you have. If you perform a critical step improperly or perform a task out of step, you will receive a fail rating.

A. System Configuration
1. Switch Gear
2. Transformers
3. Buss Ducts
4. Motor Control Center
5. Control Panels
6. AC/DC Drives
7. Generator
8. Uninterrupted Power Sources
9. Wiring

B. General Test Equipment
1. Volt/ohm meter
2. Ampmeter
3. Oscilloscope
4. Megohmmeter
5. Electrician's glove (lineman's)
6. Pull Sticks
7. Digital Thermometer
8. Infrared heat sensor
9. Turns ratio test

C. General References
1. Schematics
a. Ladder diagrams
b. Panel wiring diagrams
2. Diagrams reference manual
3. Component specifications

D. General Codes: *Critical step - Failure to meet standards for this item constitues failure.
(P) Pass - Performed the task within the stated standards.
(F) Fail - Did not perform the task within the stated standards.

1. SWITCH GEAR:

Using the proper test instruments, test for the following values:

Performance Task	Performance Standards	Instruments/ Equipment	P/F	Inst. Initials
*a. Incoming power	+/- 10% of rated values	Volt/ohm meter Amp meter		
b. Supply power to load(s)	+/- 10% of rates values	Volt/ohm meter Amp meter		
*c. Overcurrent protection	without error	Volt/ohm meter		

2. TRANSFORMERS:

Using the proper test instruments, test for the following values:

Performance Task	Performance Standards	Instruments/ Equipment	P/F	Inst Initials
*a. Primary power	+/- 10% of rated values	Volt/ohm meter Amp Meter		
b. Secondary power	+/- 10% of rated values	Volt/ohm meter Amp meter		

PRODUCTION MAINTENANCE SYSTEMS PROFILE

Systems	Equipment						
	1	2	3	4	5	6	7
A Electrical Power	Switch Gears	Transformers	Buss Ducts	*Motor Control Centers	*Control Panels	*AC/DC Drives	Generators
B Process Control	Programmable Logic Controls	Distributive Control Systems	Panelboard Controllers	* Instrumentation			
C Instrumentation	*Sensing Devices	Current to Pressure Transducers	*Transmitters	Analog Controllers	Pneumatic Controllers	*Control/Solenoid Valves	Meters
D Power Transmission	AC/Variables Drives	DC Variable Drives	*Clutches & Brakes	Gear Boxes	*Bearings, Housings and Shaft	*Seals & Packing	Couplings
E Piping	*Pumps	Regulators	Safety Relief Valve	*Traps & Filters	*Valves	Fittings & Hardware	Expansion Joints
F Hydraulic	*Pumps	* Control Panels	*Filters	Exchangers	*Hoses & Fittings	Regulators	Valves
G Pneumatic	* Air Compressors	Exchangers	*Dryers	*Filters	Traps & Filters	Lubricators	Regulators
H Material Handling	Pumps	Blowers	Scales	*Fork Lifts	*Cranes	Conveyors	Elevators
I Heat, Ventilation, Air Conditioning	Furnaces	* Motors	*Fans/Blowers	Compressors	Regulators	Pneumatic Controls	Valves
J Boilers	* Fuel Delivery System	Burners	Pressure Vessels	Safety Relief Valves	Economizers Supply	Deaerators	Pumps
K Refrigeration	*Control Equipment	Pumps	Compressors	Motors	Fans	Regulators	*Filters
L Pollution Control	Control Equipment	*Instrumentation	Motors	Blowers/Fans	Pumps	*Incinerators	*Dust Collection Equipment

*Maintenance Intensive

(over)

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APPENDIX F

Interim Third Party Evaluation Report

Title Project being Evaluated:

Industrial Technician Education Cooperative Demonstration Program

Submitted to:

John M. Patterson State Technical College

3920 Troy Highway

Montgomery, Alabama 36116

Submitted by:

J.W. Selman

606 Lee Rd. 112

Opelika, Alabama 36801

Date:

December, 1, 1990

I. INTRODUCTION

John Patterson State Technical College in Montgomery, Alabama, received a Industrial Technician Cooperative Demonstration grant from the U.S. Department of Education to support the development and implementation of an eighteen month project. The project was funded for a total of $800,000, with $494,491 being provided by the grant, $110,962 committed from institutional funds, and over $224,800 in equipment and technical data being provided by GE Plastics.

The external evaluator for the project is Dr. James W. Selman. The evaluator has had no prior association with the College other than serving once, several years ago, as a graduation speaker.

II. Evaluation Activities (July-Nov. ,1990)

Evaluation of the Industrial Technician Education Cooperative Demonstration Project consist of both internal and external procedures. During the first evaluation visit, June 25, 1990 the external evaluator, in consultation with the Project personnel reviewed the evaluation procedures. The procedures included: a review of curriculum materials and requirements as developed by the project staff; observations of the process and

procedures used in the development of the I-TEC Assessment package: periodic interviews with I-TEC students (full and part time), interviews of steering committee members, classroom and laboratory observations, consultation with project staff, and feedback from employers of program graduates and/or participants. During the initial visit of the program, the evaluator met the project staff, obtained a copy of the grant proposal, visited classroom and laboratory facilities, and met with the Dean of Instruction to discuss general plans and procedures of the evaluation process.

On August 16 and 17 the evaluator observed an Occupational Analysis Workshop. The workshop was designed to assist the researchers with the development of the I-TEC Assessment package. It provided the evaluator an opportunity to obtain information and to make observations relative to; expectations of the project from a local industry point of view, its impact on the needs of local industry, a clearer understanding of job requirements and working conditions of program graduates, and to interview selected committee members.

On the evening of August 23 and the morning of August 27 the evaluator visited the John Patterson campus to meet with I-TEC students. Class observations were made, data collection instruments field tested, and personal interviews were conducted with full time students. During these interviews students were encouraged to discuss the program in terms of its strengths and weakness.

The I-TEC Steering Committee on November 6, 1990 provided the opportunity for the evaluator to formally meet the committee. Information was obtained relative to program progress and the expectations of the committee. Several members were individually interviewed after the meeting.

III. Findings

A. COMMENDATIONS:

The I-TEC project personnel are on schedule in meeting the milestone checklist and activity objectives as indicated in the grant proposal.

Students are enthusiastic about the program and their learning experiences to date.

The curriculum modifications are focusing in on the needs and expectations of industry.

The Assessment package is slightly behind the original proposed schedule but is progressing nicely. Being slightly off schedule has been caused by the researchers not being able to schedule on-site plant visits to verify assessment items with employed workers. Although, this has forced a change in the original time table no serious negative effects have been experienced.

Steering committee members are very enthusiastic about the project and its potential benefit to the community.

Facilities and the quality of instructional equipment is

state-of-the-art and very adequate at this stage of instruction.

Project staff (full and part time consultants) are professionally prepared. The quality of instruction observed indicates a dedicated and talented instructional staff. The openness and willingness of the project staff to provide data and information requested by the evaluator should be noted.

B. CONCERNS:

There are three items of concerns that the evaluator wishes to raise at this time. It should be recognized that for the most part these items are outside the direct influence of the project staff. However, the should be brought to the attention of those working in and with the project. These items of concern are:

1. Full time students that are not presently employed as full time workers, may be denied starting jobs in the maintenance department's of some companies. This is a result of a local business practice, endorsed by some companies, that requires an employee to begin their employment in an area other than in a maintenance jobs. When a job opening becomes available in the maintenance department, qualified employees are then promoted from other jobs within the company, into the maintenance position. As previously noted, the control and effect of such a practice is outside the jurisdiction of the college and its programs; but the practice does have an effect on a the student population and the I-TEC program. The results will be impact

upon the; student enrollment patterns, structure of the college program, class schedules, staffing patterns, and job placement opportunities. However, it should be noted that, there are local employers that do not adhere to such a practice and may tend to counter balance this employment restriction.

2. Recent shift changes, by some local employers, has reduced the number of employees available to participate in the I-TEC program. This concern should be brought to the attention of plant management to facilitate future program planning. There may also be an additional topic of interest associated with shift work as it relates to the I-TEC program. The evaluator has reason to believe that some employees have participated in the program, not out of a desire to become maintenance personnel, but, to obtain a shift schedule more to their liking. This may not be a present concern of the parties involved with the program.

3. The number of full time students needs to be increased. Recruitment activities have been conducted and these activities should be continued and intensified.

APPENDIX G

INDUSTRIAL TECHNICIAN CURRICULUM WORKSHOP

JOHN M. PATTERSON STATE TECHNICAL COLLEGE
SEPTEMBER 25, 1991

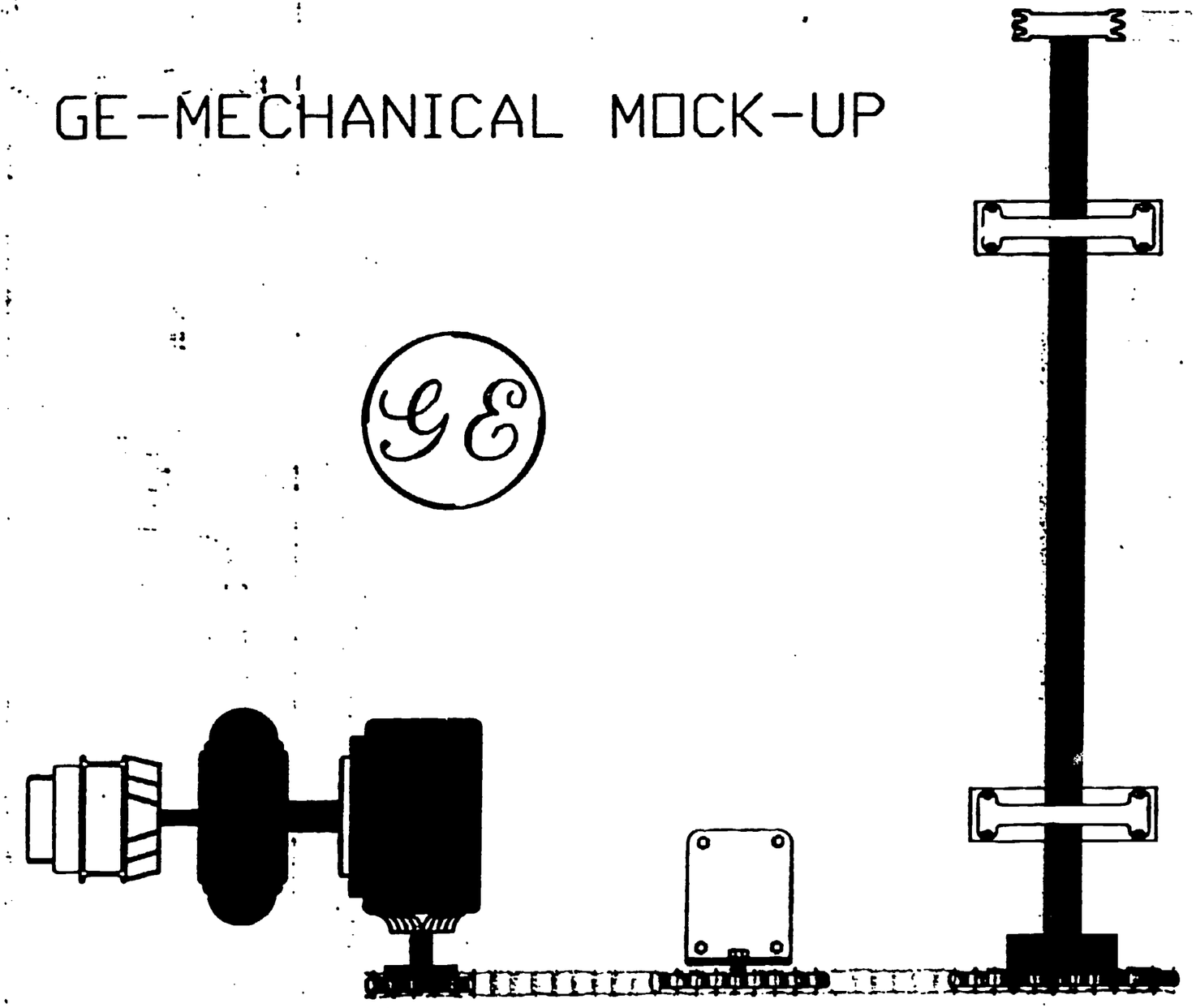
AGENDA

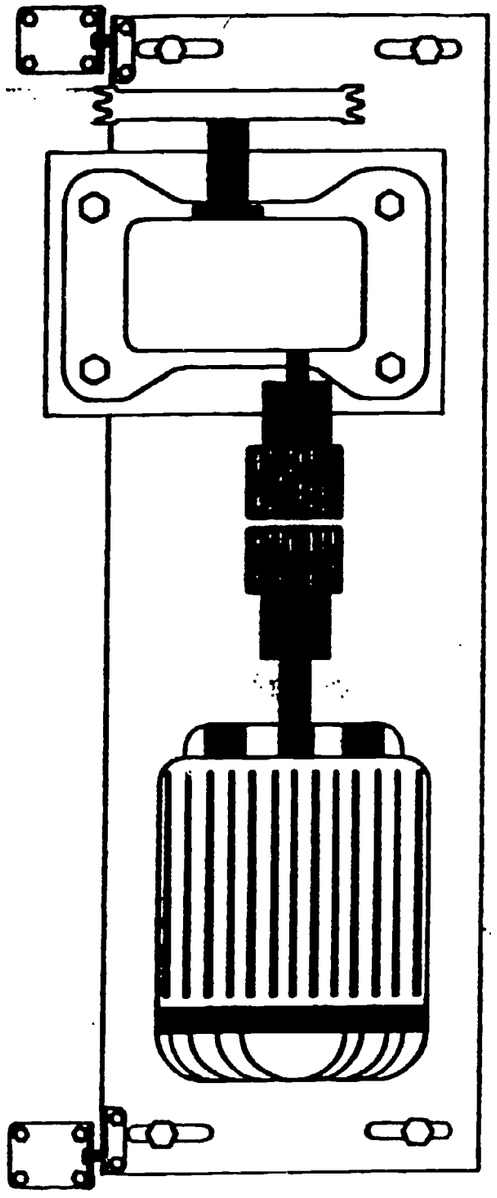
9:00 am - 10:00 am	CALL TO ORDER Dr. S. Douglas Patterson, Dean of Instruction John M. Patterson State Technical College
	WELCOME J. Larry Taunton, President John M. Patterson State Technical College
	COMMENTS Dr. Fred Gainous, Chancellor AL State Dept. of Postsecondary Education
	Dr. Willie Paul, Member Alabama State Board of Education
	PROJECT OVERVIEW Dr. S. Douglas Patterson
9:50 am - 10:20 am	BREAK
10:20 am - 12:00 n	INDUSTRIES ROLE IN PLANNING John Dellner, Plant Supervisor Jay R. Smith Mfg., Co., Inc.
	PROJECT DEVELOPMENT Jack Edwards, Project Coordinator I-TEC Project
	THIRD PARTY EVALUATION Dr. James Selman, Professor Auburn University
	SKILLS VERIFICATION & ASSESSMENT Dr. Richard Baker, Professor Auburn University
	COORDINATING WITH SECONDARY PROGRAMS Dr. Steve Franks, Dir. Voc. Education Div. Alabama Department of Education
	QUESTIONS FROM THE FLOOR Jack Edwards - Moderate
12:00 n - 1:30 pm	LUNCH (on your own)
1:30 pm	CURRICULUM REVIEW Jack Edwards and Staff
By 3:00 pm	ADJOURN

APPENDIX H

SCHEMATIC MOCK-UP

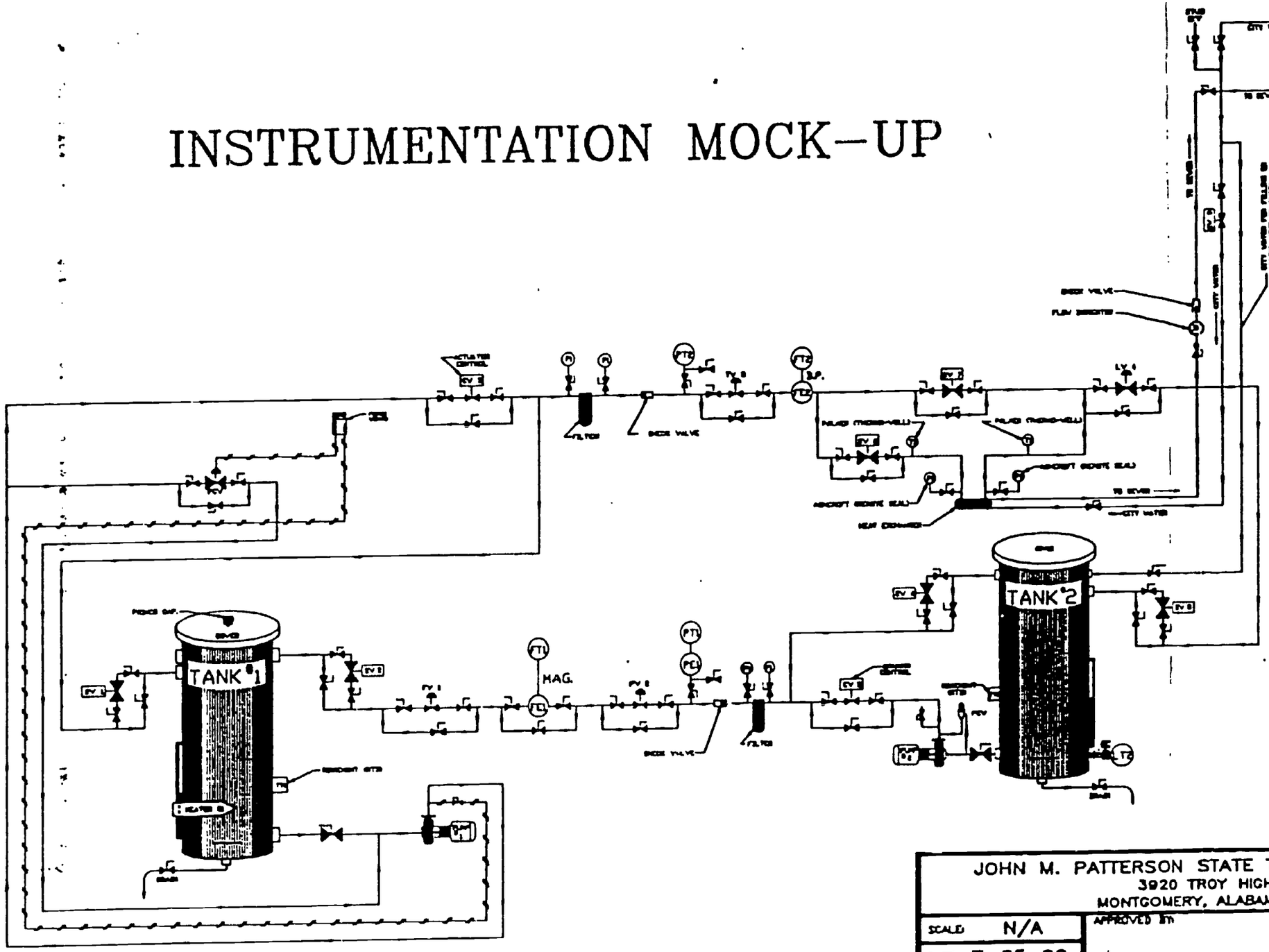
GE-MECHANICAL MOCK-UP





JOHN PATTERSON STATE TECHNICAL COLLEGE UNIVERSITY, ALABAMA	
GE MECHANICAL MOCK-UP	
GENERAL ELECTRIC MECHANICAL AND INSTRUMENTATION ELECTRONIC DRAWING	
DRAWN BY: BRUCE PARR	CHK'D BY:
SCALE: HALF-SIZE	DATE: AUGUST 4, 1980

INSTRUMENTATION MOCK–UP



JOHN M. PATTERSON STATE TECHNICAL COLLEGE 3920 TROY HIGHWAY MONTGOMERY, ALABAMA 36116		
SCALE: N/A	APPROVED BY:	DRAWN BY: L. GRAY
DATE: 7–25–90		REVISED
G E PLASTICS MECHANICAL AND INSTRUMENTATION ELECTRONIC TRAINING		
PLASTICS PROCESS FLOW CHART		DRAWING NUMBER: TET–0002

APPENDIX I

PROJECT TIMELINE

Project Month		Activity	Responsible Units								
			Steering Committee	Project Coordinator	Project Director	Employers	Curriculum Developer	Recruiter	Instructors	External Evaluator
1	1.	Initiate project		X	X					
1	2.	Develop criteria for project employees	X	X	X					
2	3.	Recruit & employ staff	X	X	X					
2	4.	Assess participation of traditionally underrepresented groups	X	X	X		X	X	X	
2	5.	Develop RFP for assessment package	X	X	X		X	X	X	
2	6.	Develop RFP for third party evaluator	X	X	X					
2	7.	Identify major potential "industry technician" employers in the area	X	X				X		
3	8.	Review initial curriculum		X		X	X	X	X	
3	9.	Use DACOM process to determine other technologies and skills for curriculum		X		X	X	X		
3	10.	Develop trainee recruitment plan		X				X		
3	11.	Assess participation of traditionally underrepresented groups	X	X	X			X		
4	12.	Contract for assessment package development		X	X					

Project Month		Activity	Steering Committee	Project Coordinator	Project Director	Employers	Curriculum Developer	Recruiter	Instructors	External Evaluator
			Responsible Units							
4	13.	Prepare facilities for the project		X	X				X	
4	14.	Develop mock-up training models		X			X		X	
5	15.	Develop training material		X			X		X	
6	16.	Review training plan for approval	X	X						
7	17.	Train instructors		X			X			
7	18.	Review assessment package for approval	X	X				X		
7	19.	Recruit potential trainees		X				X		
7	20.	Assess participation of traditionally underrepresented groups	X	X	X			X		
7	21.	Contract for evaluations		X	X					X
8	22.	Assess potential trainees						X		
8	23.	Initiate training		X			X		X	
9	24.	Conduct interim evaluation								X
10	25.	Develop interm report		X	X					X
11	26.	Revise program as needed	X	X	X		X	X	X	
15	27.	Assess program completers		X			X	X		

Project Month		Activity	Steering Committee	Project Coordinator	Project Director	Employers	Curriculum Developer	Recruiter	Instructors	External Evaluator
			Responsible Units							
15	28.	Place program completers in jobs or post-secondary technical programs		X		X		X		
15	29.	Develop dissemination materials	X	X	X		X	X	X	
16	30.	Initiate dissemination plan		X			X			
17	31.	Conduct train-the-trainer workshop for training institutions		X			X	X	X	
19	32.	Develop final report	X	X	X	X	X	X	X	X
19	33.	Submit final report			X					