DOCUMENT RESUME

ED 246 233 CE 039 248

AUTHOR Bangasser, Vi; And Others
TITLE An Emerging Technology Curriculum. A Model with Task Listings.
INSTITUTION Illinois State Board of Education, Springfield. Dept. of Adult, Vocational and Technical Education.
PUB DATE Jun 84
NOTE 109p.; Cooperative project of Jo Daviess-Carroll Area Vocational Center, Stephenson Area Career Center, and Highland Community College, Illinois.
PUB TYPE Reports - Descriptive (141) -- Guides - Non-Classroom Use (055)

EDRS PRICE MF01/PC05 Plus Postage.
DESCRIPTORS *Articulation (Education); Communications; Community Colleges; Competence; Competency Based Education; *Cooperative Planning; *Curriculum Development; Curriculum Guides; Educational Cooperation; Electronics; *Emerging Occupations; Engineering Drawing; Hydraulics; Job Analysis; Mathematics; *Models; Occupational Information; Postsecondary Education; Programing Languages; Secondary Education; Task Analysis; *Technical Education; Technological Advancement; Vocational Education; Vocational Schools
IDENTIFIERS BASIC Programing Language; Illinois

ABSTRACT

This project was designed to provide a model for secondary and postsecondary educators in planning and developing a well-articulated competency-based delivery system focusing on high-technology training. The model was to be implemented in several vocational-technical programs so that secondary students would acquire the necessary competencies to enter comparable high-technology programs at the community college level. The project involved the cooperative efforts of the Jo Daviess-Carroll Area Vocational Center, the Stephenson Area Career Center, and Highland Community College, all in northwestern Illinois. Staff members from each institution cooperated in writing a transportable model of a well-articulated competency-based secondary-postsecondary high-technology curriculum adaptable in any Illinois setting. The model outlines the procedures for analyzing the components of such a program, constructing the program, coordinating the program with business and industry, implementing the program within the existing curriculum, and recording the participating students' progress through the program. The competency-based task lists developed as a part of the project, as well as more detailed information about the task listing procedures and task transcript, are included as appendixes to this report. They cover the following topics: communications, mathematics, mechanical drafting, electronics core, hydraulics-pneumatics, and computer BASIC. (KC)

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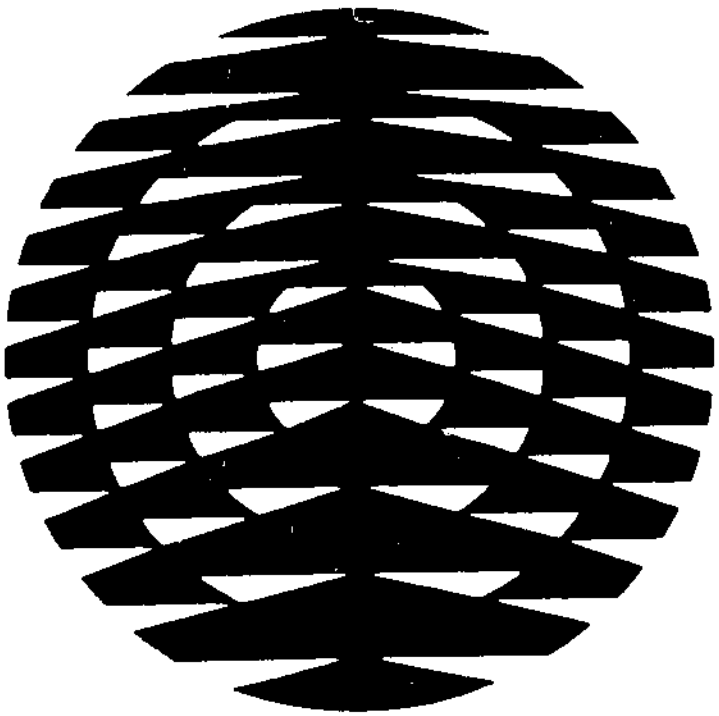
An Emerging Technology Curriculum

A Model With Task Listings

Illinois State Board of Education

Adult, Vocational and Technical Education



An Emerging Technology Curriculum

Project Staff

Administration:
Roy Monzo
Larry Zikmund
Charles Endress
Joe Kanosky

Developers:
Vl Bangasser
Diane Logothetti
Eric Ruby
David Tidaback
Eric Dietmeier
Mike Palmer
Wayne Sagstetter
Edward Brog
Dan Harms
Mary Vermeulen
Ariene Egan
Don Walz
Robert Schnoor

Stephenson Area Career Center

JoDaviess-Carroll Area Vocational Center

Highland Community College

Illinois State Board of Education

Walter W. Naumer, Jr.
Chairman

Donald G. Gill
State Superintendent
of Education

Department of Adult, Vocational and Technical Education

Research and Development Section

June, 1984

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I. INTRODUCTION

A. OVERVIEW

Articulation of vocational technical programs between secondary schools and community colleges has been advocated for quite some time. While progress has been made in terms of cooperation and examples of a number of cooperative programs currently exist, full articulation remains elusive. Articulation allows a student to achieve a smooth transition through his educational experience without unnecessary delay and duplication of effort. It saves taxpayers expensive duplication of effort, equipment, and facilities by sharing resources. Cooperative curriculum planning can also identify gaps in the learning process which can be addressed at the high school level previous to entry into the community college.

B. GOALS

The project was designed to provide a model for secondary and post secondary educators in planning and developing a well articulated competency based delivery system focusing on high tech training. The goals were intended to plan and develop a curriculum model for implementing several vocational-technical programs whereby secondary students would acquire the necessary compentencies to enter comparable high tech programs at the community college level.

I. INTRODUCTION: cont.

C. DESCRIPTION OF PROJECT AREA

This project involved the cooperative efforts of the Jo Daviess-Carroll Area Vocational Center, the Stephenson Area Career Center, and Highland Community College. The project area consists of all of Stephenson and Jo Daviess counties and part of Carroll and Ogle counties in Northwestern Illinois. This total area encompasses nineteen community unit school districts served by our three agencies.

D. DESCRIPTION OF PROJECT TEAMS

The project team consisted of staff members from each of the cooperating educational institutions. Instructors in each vocational program area selected for study and review were identified for the project. These areas included electricity/electronics, hydraulics/pneumatics, computer science, and drafting. Health care was orginally included but little progress was made in this area due to local staffing needs. In addition, instructors in mathematics, science, guidance, reading, and learning skill areas were identified and included on the project team. The project team utilized fourteen full day work sessions and many individual members worked extra time on assigned activities.

I. INTRODUCTION: cont.

E. OBJECTIVES

Objective 1

Deliver a written transportable model of a well articulated competency-based instruction secondary-post secondary high tech curriculum adaptable in any Illinois setting.

Objective 2

Develop an objective student sequential record that can be used to periodically record student achievement and which can follow a student through their academic career from institution to institution.

Achievement of these objectives provides a transportable model of a comprehensive high tech vocational education program that is useable anywhere. The model provides the procedures for analyzing the components of such a program, how the program was constructed, how to coordinate the program with business and industry, implement the program into existing curriculum, and for recording the participating student's progress through the program.

The competency based task lists developed as a part of the project in this report as well as more detailed information about the task listing procedures and task transcript are included as appendices to this report.

I. INTRODUCTION: cont.

F. PROCEDURES

The following outline of procedures on the following pages was used to implement each of our objectives from inception to completion. The project target population is high school juniors and seniors in area vocational centers who intend to continue vocational programs at the community college level. A secondary target population consists of adults who need training/retraining skill upgrading at the secondary level as a prerequisite to community college level training due to worker dislocation. This later role has not been totally acceptable to the community college leadership and serves as a major barrier to total program articulation.

5.3 PROCEDURES

OBJECTIVE 1

PROC NO	ACTIVITY DESCRIPTION	END DATE	RESOURCES	RESPONSIBLE STAFF	EXPECTED OUTCOMES	EVALUATION CRITERIA
1.1	VISIT THREE SITES TO VIEW 2+2 MODELS	31 JUL	TRAVEL FUNDS	PROJ CO-ORD	THREE POTENTIAL MODELS FOR THIS PROJECT	DOES THE PROJ CO-ORD HAVE A SYNOPSIS OF THE MODELS FROM THE SITES VISITED?
1.2	TASK IN-SERVICE	15 AUG	ALL PROJECT PERSONNEL	PROJ CO-ORD	ORIENT STAFF TO PROJECT GOALS, OBJECTIVES AND PROCEDURES	WAS IN-SERVICE HELD? DOES THE STAFF UNDERSTAND POLICIES AND PROCEDURES?
1.3	IDENTIFY COMPONENTS OF A 2+2 MODEL	30 OCT	CONSULT UNIV IND ADV COMM	PROJ CO-ORD VOC TEC INSTR	DRAFT OF MODEL FOR THIS PROJECT	IS THE DRAFT DONE? ON TIME?
1.4	REVIEW THE PRESENT HI-TECH EDUCATION DELIVERY SYSTEM	31 DEC	AREA EMP . HCC DEANS . AVC DIR ILL JOB SER JTPA .	PROJ CO-ORD VOC TEC INSTR	WHAT CAN WE KEEP? WHAT SHOULD WE ADD? WHAT DO WE CHANGE? WHAT DO WE DELETE?	IS PROC. COMPLETE? ON TIME? DID PROJECT GET INPUT FROM ALL THE APPROPRIATE RESOURCES?
1.5	DETERMINE COMPETENCIES IN FOUR U.S. VOC HI-TECH PROGRAMS WHICH CONTINUE TO GRADES 13 & 14	28 [illegible]	AREA EMP CONSULT UNIV IND ADV COMM CIVIC CONSRT DAVTE CONSULT LDE HANDBOOK 3	VOC TEC INSTR	SEQUENCED PROGRAM BY TASK FOR 11 & 12 GRADE WHICH DEVELOP GRADE 13 ENTRY LEVEL SKILLS	PROC. DONE? ON TIME? ARE ASSIGNED TASKS APPROPRIATE TO GRADE?
1.6	SEX EQUITY WORKSHOP	15 JAN	CONSULTANT LDE HANDBOOK 7	PROJ DIR	MODEL FREE OF SEX BIAS	WAS WORKSHOP HELD? DO STAFF SHOW AWARENESS OF PROBLEM AND IS THE MODEL FREE OF STEREOTYPES?

5.3 PROCEDURES

OBJECTIVE 1 - continued

PROC NO	ACTIVITY DESCRIPTION	END DATE	RESOURCES	RESPONSIBLE STAFF	EXPECTED OUTCOMES	EVALUATION CRITERIA
1.7	DEVELOP PROTOTYPE 2+2 HI TECH MODEL	15 MAR	AREA EMP CONSULT UNIV IND ADV COMM CIVIC CONSRT DAVTE CONSULT	VOC TEC INSTR	MODEL READY FOR PILOT TEST	MODEL READY ON TIME? GUIDELINES FOR USE PREPARED?
1.8	PILOT TEST THE MODEL	30 APR	AVC DIR CONSULT UNIV LDE HANDBOOKS 9 & 10	PROJ CO-ORD VOC TEC INSTR	TRANSPORTABLE MODEL OF 2+2 PROGRAM	DOES PILOT TEST SIMULATE USE IN REAL CLASSROOM?
1.9	REVIEW, CRITIQUE AND REVISE THE PROTOTYPE OF THE MODEL	31 MAY	AREA EMP CONSULT UNIV IND ADV COMM CIVIC CONSRT DAVTE CONSULT	PROJ CO-ORD VOC TEC INSTR	MODEL READY FOR PRINT AND DELIVERY	HAVE ALL THE NEEDED CHANGES BEEN MADE?
1.10	PRINT, DELIVER AND DISEMMINATE MODEL	30 JUN	CONSUL UNIV DAVTE CONSULT	PROJ CO-ORD	MODEL READY FOR DELIVERY	WAS MODEL DELIVERED ON TIME?
1.11	METAEVALUATION	CONT	CONSULT UNIV DAVTE CONSULT	CONSULTANT	PROJECT ON TIME COSTS IN BUDGET	

5.3 PROCEDURES

OBJECTIVE 2

PROC NO	ACTIVITY DESCRIPTION	END DATE	RESOURCES	RESPONSIBLE STAFF	EXPECTED OUTCOMES	EVALUATION CRITERIA
2.1	DETERMINE LEGAL CONSTRAINTS	30 AUG	CONSULT UNIV ISBE CONSULT ILL SCHOOL CODE	PROJ CO-ORD	COMPLIANCE WITH APPLICABLE STATUTES AND REGULATIONS	IS REVIEW PROCESS ADEQUATE TO INSURE COMPLIANCE?
2.2	REVIEW PRESENT SYSTEM TO RECORD AND TRANSMIT STUDENT RECORDS	30 SEP	LEA GUIDANCE COUNSELORS COMM COLLEGE ADMISSIONS	PROJ CO-ORD	A LIST OF INFORMATION WHICH SHOULD FOLLOW STUDENT THRU A 2+2 PROGRAM, AND A LIST OF NEEDED CHANGES, ADDITIONS, ETC., TO REVISE SYSTEM	DOES STUDENT RECORD SYSTEM SHOW THE NEEDED INFORMATION? DOES IT COMPLY IN THE REG AND STATUTES?
2.3	DETERMINE A LIST OF SKILLS PREREQUISITE TO ENTRY LEVEL EMPLOYMENT	30 NOV	IND ADV COMM UNIV CONSULT AVC DIR HCC DEANS DAVTE CONSULT LDE HANDBOOKS 9 & 10	PROJ CO-ORD	LIST OF SKILLS WHICH MUST BE MASTERED FOR ENTRY LEVEL EMPLOYMENT	IS THE LIST COMPLETE? ARE THIS SKILLS INCLUDED IN THE SYLLABLES FOR HI-TECH CURRICULUM?
2.4	DEVELOP PROTOTYPE OF PASK RECORD FORM	31 JAN	LEA GUIDANCE COUNSELORS CONSULT UNIV HCC DEANS	PROJ CO-ORD	PASK PROTOTYPE WHICH CAN BE PILOT TESTED	DOES PROTOTYPE CONTAIN ALL THE SKILLS NEEDED? MASTERED?
2.5	CRITIQUE AND REVISE FORM	28 FEB	LEA GUIDANCE COUNSELORS CONSULT UNIV DAVTE CONSULT HCC DEANS	PROJ CO-ORD	PASK MODEL READY TO BE PUT IN FINAL FORM	DOES REVIEW/CRITIQUE/ PILOT TEST SIMULATE USE IN REAL ENVIRONMENT?
2.6	DEVELOP PASK IN FINAL FORMAT	30 APR		PROJ CO-ORD	DELIVERABLE PASK SYSTEM	HAS THE PASK MODEL BEEN COMPLETED ON TIME? WITHIN BUDGET?

I. INTRODUCTION: cont.

G. DEFINITIONS OF TERMS

Vocational-technical training in the past vocational training has suggested the development of a single skill or a limited number of skills applied in a specific narrow area. It appears that many people including educators still perceive vocational training in terms of shop activities, students with discipline problems, and/or limited academic ability or motivation. In today's job market vocational-technical training involves specific skill training but also includes the applied aspects of mathematics, science, and communications. Students who complete these programs are expected to be able to make a positive contribution to business and industry in jobs involving technology and its many rapidly emerging applications.

High technology - the use of the term is widespread but seems to be interpreted differently by many individuals in education, government, industry, and the media. Since we found a variety of definitions in current literature, we simply agreed that high tech industries were labor intensive, research oriented, and had a high value added to their product. The U.S. Department of Commerce lists four industries as High Tech. Namely, (1) Computers; (2) Robotics, (3) Semi-conductors; and (4) Telecommunications. Since most jobs in these industries

G. DEFINITIONS OF TERMS: cont.

emphasize scientific research and development, they require a high skill and knowledge proficiency. A much greater demand is evolving in jobs utilizing the resources and applications of high tech. These jobs seem to require a grounding in several basic technologies as well as applied mathematics, science, and communications skills plus a commitment to further training as needed.

Competency-based vocational education (CBVE) - competency based education is described by several terms including performance based instruction, criterion referenced mastery learning, proficiency based education, and others. In any event, it refers to a system whereby job tasks are identified and validated, performance objectives are written prior to instruction, and criterion referenced measures are developed which relate to the objectives. Students are expected to master a job task before going to the next skill and all programs are open entry-open exit. The emphasis is on performance rather that the traditional learning of factual information. It is a totally individualized self-paced system.

II. NEEDS ASSESSMENT

Throughout the project we have tried to secure current information relating to trends and needs in the vocational program areas we were investigating. We have utilized local, state, and federal census data; labor market supply and demand data; local follow-up data; and we are preparing to obtain student interest data. Likewise, we have had available information from several conferences relating to emerging technology as well as the benefit of the consortium activities from the Education for Employment project itself. Inasmuch as the project was provided with technical assistance, we have not included additional formal activities in a review of current literature, commission reports, master plans, research information, etc.

With the impact of the recent national reports on excellence in education, there has been no lack of ideas relating to this problem and educational reform. Many of these proposals seem to simply suggest adding to the status quo rather than true reform. Likewise, numerous articles deal with the future impact of technology on employment needs and the changing nature of the emerging work force.

II. NEEDS ASSESSMENT: cont.

As we began the project, the thrust was to prepare students to enter what are generally regarded to be high tech jobs. As we have progressed, current information makes it clear that future job opportunities in high technology jobs will only exist in limited numbers. In fact the challenge seems to be to prepare people to work and live effectively in an information society in which most job opportunities will come from innovation utilizing the applications of technology. Many of the issues relating to education for technology employment remain unresolved because of conflicting opinions and interpretations relating to the supply, demand, and nature of future employment needs at the local, state, and national levels.

III. DESCRIPTION OF THE HiTAM MODEL

A. COMPONENTS

1. SUPPORT
   - a. Administrative
   - b. Counseling/Guidance
   - c. Technical
     - (i) Labor Market Information
     - (ii) D.O.T. references and skills
     - (iii) Advisory Committee inputs
     - (iv) Evaluation
     - (v) Dissemination
   - d. Logistical
     - (ı) Equipment and supplies
     - (ii) Texts and references
     - (iii) Facilities

2. STAFF
   - a. Credentials
   - b. Competencies
   - c. Experience
   - d. In-service

3. CURRICULUM
   - a. Philosophy
   - b. Psychology
   - c. (per career cluster)
     - (i) content
     - (ii) sequence
     - (iii) methods
     - (iv) related skills
     - (v) texts and references
     - (vi) equipment and facilities

B. PROCEDURES

1. ESTABLISHMENT AND USE OF ADVISORY COMMITTEES

2. USE OF COMMUNITY BASED ORGANIZATIONS

3. DEVELOPMENT OF TASK (SKILLS) LISTS

4. DEVELOPMENT OF RESOURCE AND IMPLEMENTATION MATERIALS
   - a. Tests,references, learning guides, tests, etc.
   - b. Equipment, facilities and supplies
   - c. Staff
   - d. Support

C. DEVELOPMENT OF AN EVALUATION MODEL

D. DEVELOPMENT OF A DISSEMINATION MODEL

III. DESCRIPTION OF THE HI TAM MODEL: cont.

A. COMPONENTS

1. SUPPORT for curriculum improvement

a. Administrative - all levels of the administrative structure must be informed of the curriculum studies, activities, and progress and must support a need for change.

b. Counseling/Guidance - guidance personnel must also understand the total thrust for curriculum change since they play a big role in working with students in implementations of change through student recruitment.

c. Technical support data - it is essential to obtain as much data as possible from any source in the target area directly impacted by the project. These should include but would not necessarily be limited to:

1. Local, regional, and national labor market information.

2. D.O.T. reference information regarding job titles, descriptions, qualifications, etc.

III. DESCRIPTION OF THE HI TAM MODEL: cont.

3. Advisory committee inputs. Advisory components formulated from school staff, students, parents, lay citizens, employees, local government, legislature, etc. to provide input into program development and to assist with follow-up and evaluation.

4. Evaluation - activities designed to formulate some kind of evaluation strategy must be developed. Such activities are generally organized in terms of purpose, method, and specific identified tasks. The evaluation itself is summative and measures outcomes relative to goals and expectations. It should also include formative information to assist in the on-going development and implementation of curriculum change.

5. Dissemination - If the primary purpose of curriculum development is to improve and change program and services, well planned dissemination activities are essential. The "use" definition of dissemination suggests "four levels of assistance", namely awareness, understanding, decision, and implementation use.[1] There are a variety of dissemination activities and the conceptual framework must be carefully planned to be effective.

[1] Dissemination Manual for Enhancing Program Improvement, Illinois State Board of Education, 1982

III. DESCRITPION OF THE HI TAM MODEL: cont.

d. Logistical Needs - In any project for curriculum and program improvement, adequate support for change must be provided in terms of equipment, supplies, instructional resources, and building facilities. This is especially critical in terms of change due to technological advancement. With rapid changes in technology, an almost immediate absolescence becomes a factor. The target student population must also be delineated.

2. Staff Qualifications

In an era of emerging and changing technology, the over-all quality of staff must be continually evaluated and up-dated. There is little doubt that attempts are made to secure the best qualified personnel available in terms of training and experience. Education must compete with business and industry for technically qualified people and remains at a definite disadvantage in terms of salaries and other benefits.

Nevertheless a staff development plan should be prepared and implemented to insure quality up-to-date instructional programs. Short term workshops and in-service activities may be useful but tend to disrupt the continuity of the local instructional program when they involve numerous staff members.

III. DESCRIPTION OF THE HI TAM MODEL: cont.

3. Curriculum - Basic to any vocational program improvement is the curriculum itself and its major components.

a. Philosophy - this would include a statement of how the local or regional program fits into the broader perspectives at the state and national level. It should also indicate the populations to be served and how the program would fit with other educational efforts.

b. Psychology - This consideration in general must deal with teaching and learning styles to blend theory and practice. Specific consideration should be given to learning modalities and domains.

c. Implementation strategy per career field - This area traditionally deals with such considerations as

(1) program content
(2) sequence
(3) methods
(4) related competencies
(5) text and reference materials
(6) equipment and facilities

Implementation strategy requires a full understanding of the proposed curriculum changes including the broad purpose and the specific thrusts of each part of the program. With competency-based programs, it requires a full understanding of CBVE as well.

III. DESCRIPTION OF THE HI TAM MODEL: cont.

B. PROCEDURES

1. Establish and use advisory committees - The use of advisory committees in vocational education has been advocated for a long time and they have been effective in local programs improvement. We have now reached the point where technology demands educational reform and new ways must be found to utilize citizens to determine a new direction for education. The use of advisory committees may indeed be helpful in overcoming the traditional bureaucracy of the education establishment. Resources on the organization and management of advisory committees are readily available.[1][2]

2. Use of community organizations and resources - effective use of resources available in the community promotes cooperation between all segments of the community. It will lead to a better understanding of the community's resources as well as its needs. It should help bring about programs to meet the emerging needs brought about by technology. An evaluation of these resources should lead to use of more resource personnel; better utilization of the community facilities for field trips, work experience, and placement; more staff in-service; an effective public relation program; and a provision that programs remain practical and current.[3]

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1 Cochran, Phelps, and Cochran, Advisory Committees in Action, Allyn and Bacon, 1980.

2 "A Guide For Local Advisory Councils in Vocational Education," SACVE, 1982.

3 Analyzing Community Resources, Locally-directed Evaluation Handbook Guide XI, ISBE, 1982

III. DESCRIPTION OF THE HI TAM MODEL: cont.

3. Development of Task (skills) Lists - It must be understood that we have assumed the development of a competency-based vocational education program which initially requires considerable time and effort. It seems to be justified in terms of student outcomes that are generally superior to traditional instructional methods. The tasks which follow have essentially been identified by Blank [1] as follows

   (a) identify job tasks
   (b) analyze job tasks and add knowledge tasks
   (c) write terminal performance objectives
   (d) sequence tasks and terminial performance objectives (see table 1-2)

4. Development of resource and Implementation Materials

   (a) Prepare performance and written tests

   (b) Prepare competency-based learning guides with supporting text and reference materials audio visual, video, etc.

   (c) Secure necessary equipment and supplies

   (d) Identify and provide for learning management system including support services, media, student services, special needs, etc.

   (e) Secure qualified staff and implement necessary training programs.

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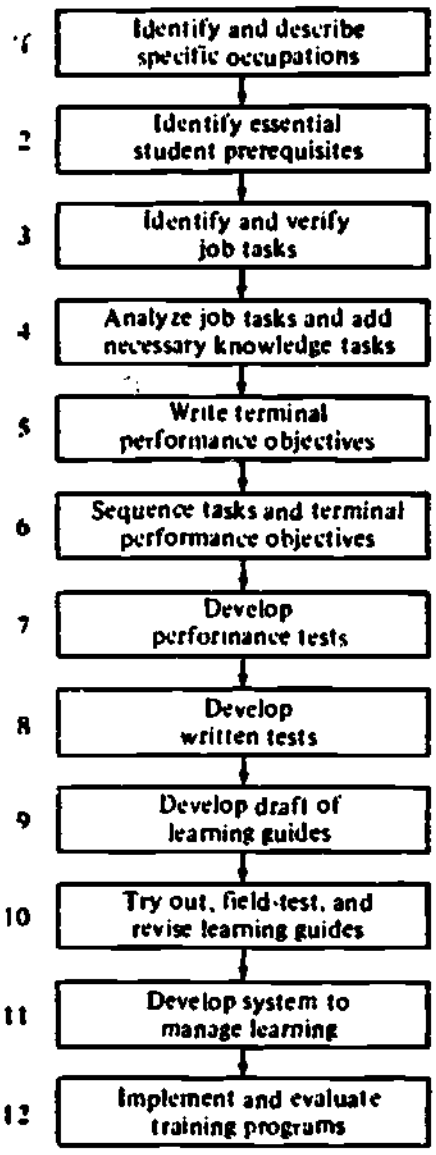
1 Blank, William E., Handbook for Developing Competency Based Training Programs, Prentice-Hall, 1982

TABLE 1-2
Twelve Tasks To Be Accomplished To Develop a Competency-Based Training Program



IV. DEVELOPMENT OF AN EVALUATION MODEL

The evaluation component of the model follows the CIPP model (Stufflebeam '71). This model divides the evaluation process into four parts - context, input, process and production evaluation. Context evaluation is rooted in needs assessment and asks the question "Where are you going?" Input evaluation assesses capability and resources. The essential question of this section is "How will you get there?" Process evaluation is intended to detect deficiences in program design and implementation. It is formative in nature and asks the question "How are you doing?" Product evaluation is summative in nature, determines if goals and objectives were met, and asks the question "Did you make it?" The model is cyclical in that product evaluation helps determine new needs and formulate new goals. The model is easy to understand and put in place. The process evaluation section may be augmented with assistance from the Locally Directed Evaluation Handbook (ISBE, '82).

The purpose of the evaluation component is to insure the goals and objectives are met in their entirety, on time, and within budget.

The evaluation is limited to the project only. Available resources include staff from consulting universities, consulting assistance from DAVTE, local staff evaluation consultants, and documents

IV. DEVELOPMENT OF AN EVALUATION MODEL: cont.

generated by the project, such as reports, products, and fiscal records. If needed, data gathering instruments should be indentified and used. Guides for collecting, processing, analyzing, reporting, dissemination, and implementation are apart of the evaluation procedure. The evaluation is continuous beginning with contract and ending at contract completion.

For implementation of the evaluation component the strategy has been to have the project staff consider key questions for each procedure (activity) of the project objectives which provides a focus for Input and Process Evaluation. These two component parts, in particular, determine if effective use of resources is being made, if progress is being made, and provide feedback concerning what needs to be changed. The implementation of these two components (Input and Process) will be augmented by the Mager-Pipe Model (Mager-Pipe, '78). The technique here is to ask a series of questions such as "What is the problem?" "Is it serious?" "What is the proposed solution?" "What is the impact on time and resources if the proposed solution is implemented?" "Are there alternative solutions?" "What are the impacts?" After these choices are considered, a decision is made and implemented, and mode reverts to Process Evaluation.

V. DEVELOPMENT OF A DISSEMINATION MODEL

Our model involves the use a "stair step" approach, patterned after similar taxonomy models. The dissemination awareness model is as follows:

4. Implement the outcome (or continue use)
3. Decide to use or not use the outcome
2. Understand project outcomes and possible use
1. Aware of project outcomes

DISSEMINATION PLAN OUTLINE

Dissemination Goals include

A. List of Outcomes
B. Identify the Target Audiences
C. Determine Level of Awareness of the Audience for the Outcome Disseminated

The list of outcomes is developed from the project objectives and procedures. Our outcomes included:

1. Component parts of the curriculum development model
2. A prototype model
3. The completed model
4. Competencies for specific curricula - drafting, electronics, hydraulics, etc.
5. Methods to use existing resources such as staff, equipment, facilities and funds
6. Method to record individual participants progress through the program

V. DEVELOPMENT OF A DISSEMINATION MODEL: cont.

The target audiences for dissemination would include:

1. Students
2. Parents
3. Instructional staff at high schools, vocational centers and community colleges.
4. School Administrators.
5. Board of LEA's, vocational centers and community colleges
6. General Public
7. Business and industry leaders

DISSEMINATION ACTIVITIES

Activities conducted to disseminate outcomes to projected audiences include:

1. Inservice seminars for certified staff at the vocational centers and the community colleges.
2. News releases to local newspapers, broadcast media, school newspapers and other newsletter type information the LEA's distribute.
3. Verbal presentations by project staff, including the use of audio visual materials, such as slides, transparencies and video tapes.
4. Formal reports including interim and final reports.

On the following page, schematics diagram how a specific activity could be used to disseminate an outcome to one projected audience, and assist that audience in reaching an anticipated level of awareness.

Outcomes

I. Components
II. Competencies
III. Resource Use
IV. PASK
V. Prototype
VI. Final Model

Audiences

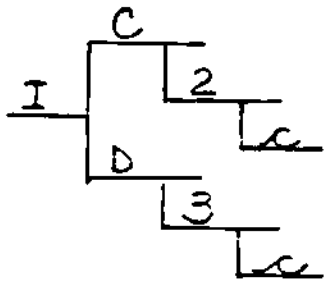
A. Students
B. Parents
C. Certified Staff
D. Administration
E. Board Members
F. General Public
G. Business/Industry Leaders

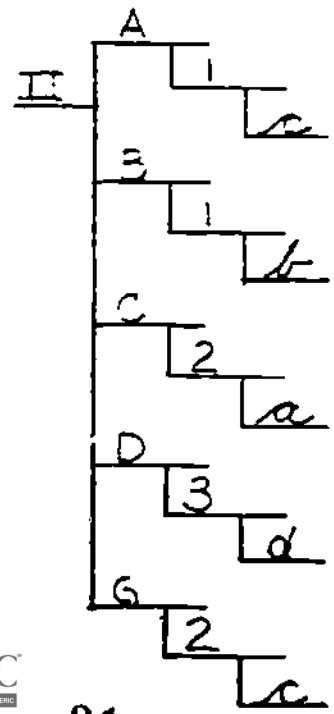
Awareness Level

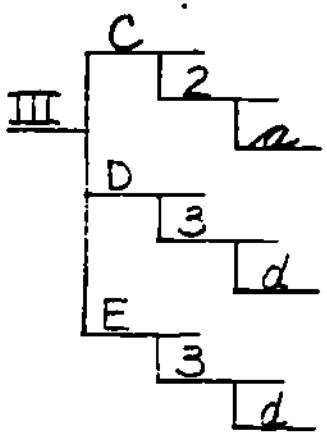
1. Aware
2. Understand
3. Decide
4. Implement

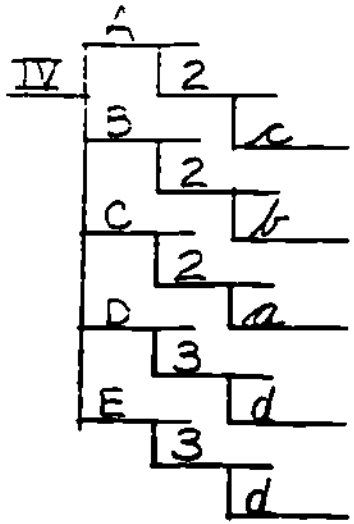
Dissemination Activity

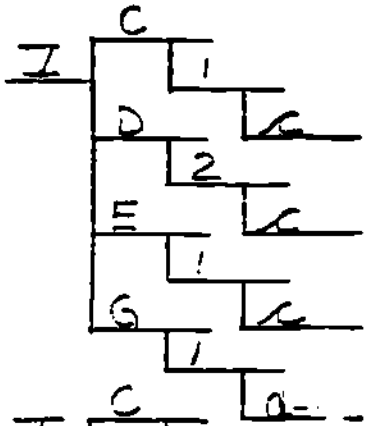
(a) Inservice
(b) News Release
(c) Presentation
(d) Formal Report

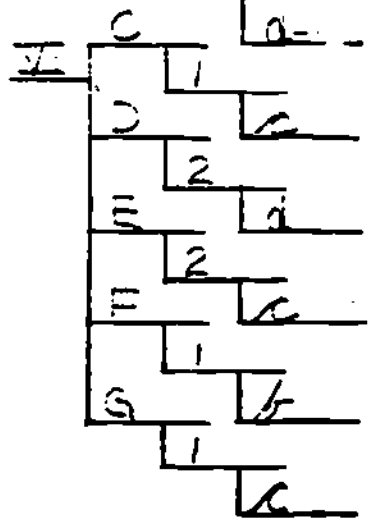












V. DEVELOPMENT OF A DISSEMINATION MODEL: cont.

FOLLOW UP ACTIVITY

Follow-up activities include

A. Baseline Information Gathering

B. Three to Six Month Follow-Up

Baseline information gathering consist of three activities:

1. Determine how effective the dissemination activity was for that audience regarding a specific outcome;
2. Identify what, if any, further assistance the audience needs to reach their desired level of awareness; and
3. The use which the audience intends to make of their awareness of the outcome; i.e., which level of awareness do they intend to reach.

Activity one, determine effectiveness, is conducted by having the audience fill out rating scales after the activity is complete. The rating scales can be developed with assistance from an evaluation consultant. At appropriate times throughout an activity target audiences are sampled to see if goals are being met.

The survey instrument developed for activity one can also query the audience concerning activities two and three. If members of the audience indicate a need for additional information to reach their desired level of awareness, the assistance/information should be provided.

V. DEVELOPMENT OF A DISSEMINATION MODEL: cont.

Once intended use is established, the survey instrument will serve as baseline information so that achievement comparisons can be made three to six months later. Another aspect of this activity to determine why the intended goal was not met, if that is the case, and what the project might do to provide further assistance. Follow up activities at the three to six month level should be developed, along with appropriate instruments, with the assistance of the staff evaluation consultants.

For further resources and more specific information refer to the Dissemination Manual for Enhancing Program Improvement, ISBE, June 1982.

VI. TASK LISTINGS

The major thrust of our project activities was the preparation of task listings to be utilized in the development and implementation of an articulated secondary-community college curricula in a number of vocational program areas. In addition program planning in electronics and mechanical drafting followed the general Hi TAM curriculum model already described.

The task listings identified in Communications (Appendix A) and Mathematics (Appendix B) skills are intended for implementation at the elementary and secondary level. The task listings in Mechanical Drafting (Appendix C) and the Electronics Core (Appendix D) are essentially complete and are the basis for an articulated secondary/post secondary vocational program in these areas. The Hydraulics-Pneumatics (Appendix E) task list is not completed but represents the beginnings of part of an automated manufacturing curriculum which will be developed in the near future. The Computer BASIC task lists (Appendix F) is appropriate at both secondary and post-secondary levels and articulation between cooperating institutions is essential for student progress without duplication of effort.

Pilot implementation of curriculum developed from those task listings will be an on-going part of vocational program development in these areas.

VII. TASK TRANSCRIPT

A second project objective was to develop a format and records management system for recording student Proficiency/Ability/Skill/ and for each student as well. It is our intent that this objective sequential record follow a student from one vocational training institution to another and then on to employment.

With the development of competency based vocational education, teachers have had potential access to a computerized system of objectives. These competencies have been generated through research efforts obtained and validated from business and industry needs and have been determined to be the skills, knowledges and/or attitudes needed for employment in specific jobs.[1]

Since an assessment of student attainment of objectives is based solely upon the objectives themselves, objectives must be clearly stated measureable student performance objectives. If reported and disseminated in a proper format, data and information obtained from assessing student competency based objectives can be used for multiple purposes. Cumulative student performance records provide a simple mechanism for summarizing and reporting student progress. In a task listing transcript, the outcome statements from each student performance objective are simply listed on the student

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1 Oen, Urban T, Competency Based Vocational Education (CBVE), What Is It? How Does It Work? Written presentation, CIVE Project, Addison, Illinois

VII. TASK TRANSCRIPT: cont.

transcript by task areas and are generally in the order of presentation in the instructional program. A certificate containing the competencies achieved or mastered is provided the student upon request or upon exiting a program. We have previously developed and utilized such a system for preparing an completed by each student using a main frame computer. With the advent of larger capacity micro-computers, we have developed a student record management system utilizing the IBM PC micro-computer and a Lotus 1-2-3 software program. Many competencies common to an entire class may be transferred immediately from an existing vocational program data base to an individual student's task record. However, individual programs designed specifically to meet an individual career objective that ultimately cross existing program task listings are also possible.

With mutual cooperative planning and the regular articulation of curriuclum, it should be possible to make available a current complete task transcript to any student showing progress to date from point of entry into any vocational program. The student in turn can utilize this transcript as a resume to indicate his competencies to a potential employer or as a transcript upon transfer to another educational level in his vocational program.

VII. TASK TRANSCRIPT: cont.

Specific details in regard to the assessment of student attainment of objectives are found in the LDE Handbook listed below [1]. An example of a micro-computer generated comulative student performance task transcript (PASK) is shown as on the following page:

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1 Wentling et. al, Measuring Student Competencies, Local Leader Guide III, Locally-Directed Evaluation Handbook, Second Edition 1982

STEPHENSON AREA CAREER CENTER
FREEPORT IL.
TECHNOLOGY FOR EMPLOMENT PROJECT

COURSE TITLE - HYDRAULICS AND PNUEMATICS TECHNOLOGY
INSTRUCTOR --- M. PALMER

DEPT. 900 TASK LISTING FOR JOHN DOE
PROG. 600

TASK NUMBER	CONTR HRS	MAST HRS	TASK DESCRIPTION
100-001	6	4	IDENTIFY HYD. SYSTEMS + CAPABILITIES
100-002	6	5	IDENTIFY HYD. PRINCIPLES
100-003	6	6	IDENTIFY HYD COMPONENTS
100-004	6	5	IDENTIFY FLUID POWER ANSI SYMBOLS
100-005	8	9	IDENTIFY TOOLS & TEST EQUIP USED IN HYD
100-006	8	8	IDENTIFY HYD HOSES, LINES & FITTINGS
100-007	6	6	IDENTIFY TYPES OF HYDRAULIC FLUIDS
100-008	9	6	SERVICE SIMPLE HYD LINES, HOSES & FITTINGS
100-009	12	13	IDENTIFY TYPES & DESCRIBE FUNCTIONS OF HYD FILTERS & FILTER SYSTEMS
100-010	10	8	SERVICE BASIC HYD FILTERING SYSTEMS
100-011	10	11	IDENTIFY TYPES & DESCRIB FUNTIONS OF HYDRAULIC CONTROL VALVES
100-012	14	15	SERVICE BASIC (SPOOL) HYD CONTROL VALVES
100-014	16	13	IDENTIFY TYPES & DESCRIBE FUNCTIONS OF HYD PUMPS
100-015	18	17	SERVICE BASIC HYD PUMPS
100-016	8	10	IDENTIFY & DESCRIBE FUNTION OF HYDRAULIC ACCUMULATOR
100-017	10	7	IDENTIFY & DESCRIBE FUNCTIONS OF HYD SERVO SYSTEM
100-018	10	8	SERVICE BASIC HYD SERVO SYSTEM
100-019	8	9	IDENTIFY & DESCRIBE FUNTIONS OF HDY CYLINDERS

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COURSE TITLE - HYDRAULICS AND PNUEMATICS TECHNOLOGY
INSTRUCTOR --- M. PALMER

DEPT. 900 TASK LISTING FOR JOHN DOE
PROG. 600

TASK NUMBER	CONTR HRS	MAST HRS	TASK DESCRIPTION
100-020	12	10	SERVICE HYDRAULIC CYLINDERS
101-001	13	14	DESCRIBE ADVANCED PRESSURE & FLOW PRINCIPLES
101-003	12	12	DESCRIBE & IDENTIFY SOPHISTICATED SERVO SYSTEM CHARACTERISTICS
101-004	16	15	IDENTIFY & DESCRIBE SOPHISTICATED HYD CONTROL SYSTEMS
101-005	16	17	IDENTIFY & DESCRIBE SOPHISTICATED HYD PUMPING SYSTEMS
101-006	18	20	IDENTIFY & DESCRIBE SOPHISTICATED HYD CIRCUITRY
101-008	18	18	TEST HYD SYSTEM
101-013	8	7	IDENTIFY & DESCRIBE FUNCTIONS OF HYDRAULIC RESERVIORS
101-014	8	9	SERVICE HYD RESERVIORS
101-015	6	6	SERVICE HYD FILTERING SYSTEMS
101-016	8	8	SERVICE HYD CYLINDERS
200-001	8	8	IDENTIFY PNEUMATIC SYSTEMS & THEIR CAPABILITIES
200-002	10	9	IDENTIFY PNEUMATIC PRINCIPLES
200-003	10	11	IDENTIFY PNEUMATIC SYSTEM COMPONENTS & THEIR FUNCTIONS
200-004	12	12	IDENTIFY TOOLS, TEST EQUIPMENT & STANDARDS COMMON TO PNEUMATIC POWER
200-005	6	7	IDENTIFY LINES, & FITTINGS USED IN PNEUMATIC POWER
200-006	8	5	MEASURE CUT & FABRICATE PNEUMATIC LINES
200-007	8	6	TEST PNEUMATIC LINES

STEPHENSON AREA CAREER CENTER
FREEPORT IL.
TECHNOLOGY FOR EMPLOMENT PROJECT

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INSTRUCTOR --- M. PALMER

DEPT. 900 TASK LISTING FOR JOHN DOE
PROG. 600

TASK NUMBER	CONTR HRS	MAST HRS	TASK DESCRIPTION
200-008	8	7	IDENTIFY PNEUMATIC COMPRESSORS TYPES
200-009	8	8	DESCRIBE APPLICATIONS FOR DIFFERENT TYPES OF COMPRESSORS
200-010	6	6	DESCRIBE AIR COMPRESSOR OPERATION-HOW IT WORKS
200-011	12	13	SERVICE BASIC AIR COMPRESSOR
200-014	10	11	IDENTIFY PNEUMATIC CONTROL SYSTEMS
200-015	10	10	DESCRIBE OPERATION OF AIR VALVES
200-016	12	11	TEST & SERVICE BASIC AIR VALVES
200-017	6	6	IDENTIFY PNEUMATIC CYLINDERS
200-018	8	8	TEST & SERVICE PNEUMATIC CYLINDERS
200-019	8	9	IDENTIFY MOISTURE & AIR QUALITY CONTROL SYSTEMS USED IN PNEUMATICS & THEIR APPLICATIONS
200-021	14	15	TROUBLE SHOOT BASIC PNEUMATIC SYSTEMS
201-006	10	9	PRESCRIBE PNEUMATIC COMPONENTS FOR CIRCUITS
201-008	12	9	IDENTIFY USES & FUNCTIONS OF INDUSTRIAL AUTOMATED SYSTEMS

Student Signature

Authorized Signature

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9. Rodenstein, J. and Lambert, R., Microcomputers: Applications in Vocational Education, Vocational Studies Center, University of Wisconsin, Madison, Wisconsin 1982.

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HIGHLAND COMMUNITY COLLEGE
STEPHENSON AREA CAREER CENTER

EDUCATION FOR TECHNOLOGY PROJECT

COMMUNICATIONS SKILLS

APPENDIX A

Listening, speaking, reading, writing, and interpersonal skills comprise the communication competencies deemed necessary for success in the HI-TAM Project.

The majority of the reading tasks will have been mastered by students by the end of eighth grade. Study of technical materials should occur in content area courses.

The basic writing tasks would be learned in language arts courses through eleventh grade. A greater amount and variety of writing needs to be taught in grades seven to eleven. By graduation from twelfth grade students should have successfully completed a composition course. Of necessity some technical writing skills must be learned in content areas. At the post-secondary level students will take a technical writing course.

Listening, speaking, and interpersonal relations skills are presently neglected in the secondary high school curriculum especially for students who do not take speech/drama courses. One semester of speech should be required at the post secondary level.

One strategy for assessing competency in language arts skills is to administer competency examinations on or about ninth grade which measure acquired skills necessary for entry and success in the HI-TAM Project. At this time, students who are deficient in language arts will have time to make up these deficiencies while in high school. Assessment tests upon entrance into post secondary education courses would be required.

Effective communication skills are an integral part of the HI-TAM Project. The attached task lists are suggested skills necessary for a successful career in the HI-TECH area. They should be mastered in the standard curriculum prescribed for seventh grade through post secondary levels.

LISTENING TASKS

STUDENTS WILL --

- BE AWARE OF COMMON STYLES OF LISTENING ACTIVELY: ADVISING, JUDGING, ANALYZING, QUESTIONING, SUPPORTING.
- RESTATE OR PARAPHRASE A CONVERSATION TO CONFIRM ONE'S OWN UNDERSTANDING OF WHAT WAS SAID.
- LISTEN TO COMPLETE IDEAS OF ANOTHER WITHOUT REDUCING WHAT IS SAID TO ONE IDEA.
- ASK APPROPRIATE QUESTIONS TO CLARIFY ANOTHER'S ORAL COMMUNICATION.
- IDENTIFY THE CONCLUSIONS IN OTHERS' ORAL COMMUNICATIONS.
- TAKE ACCURATE NOTES WHICH SUMMARIZE MATERIAL PRESENTED VERBALLY.
- BE AWARE OF POSITIVE, CRITICAL EVALUATION OF OTHERS' ORAL PRESENTATION.
- BE AWARE OF THE INFLUENCE OF INTERFERENCES ON LISTENING COMPETENCE. (signal-to-noise ratio, semantics, personality conflicts)
- ATTEND TO NON-VERBAL CLUES, SUCH AS EYE CONTACT, POSTURE, AND GESTURES FOR MEANINGS IN OTHERS' CONVERSATIONS.
- CARRY OUT ORAL INSTRUCTIONS GIVEN BY ANOTHER.

SPEAKING TASKS

STUDENTS WILL --

- SPEAK FLUENTLY WITH INDIVIDUALS OR GROUPS.
- SPEAK EFFECTIVELY USING APPROPRIATE BEHAVIORS, SUCH AS EYE CONTACT, POSTURE, AND GESTURES.
- ORGANIZE AN INFORMATIVE ORAL PRESENTATION USING RESEARCH ON A PARTICULAR TOPIC OR SUBJECT.
- USE VISUAL AIDS AS A TOOL IN ORAL PRESENTATIONS.
- EXPLAIN A PROCESS IN A LOGICAL, SPECIFIC METHODS.
- ORGANIZE IDEAS MENTALLY AND PUT THEM INTO WORDS RAPIDLY IN ORAL PRESENTATION.
- INSTRUCT OR DIRECT SOMEONE IN THE PERFORMANCE OF A SPECIFIC TASK.
- PARTICIPATE IN PROBLEM SOLVING THROUGH A GROUP DISCUSSION PROCESS.
- DEVELOP AGENDA FOR GROUP DISCUSSIONS.

READING TASKS

STUDENTS WILL --

- USE THE PRONUNCIATION KEY OF A DICTIONARY TO PRONOUNCE CORRECTLY UNFAMILIAR AND TECHNICAL WORDS.
- USE A DICTIONARY TO DIVIDE UNFAMILIAR WORDS TO FACILITATE PRONUNCIATION.
- USE A DICTIONARY OR GLOSSARY TO OBTAIN THE MEANING, PRONUNCIATION, AND SPELLING OF WORDS.
- LOCATE INFORMATION BY USING AN INDEX.
- LOCATE INFORMATION BY USING A TABLE OF CONTENTS.
- LOCATE APPROPRIATE REFERENCE MATERIALS IN THE LIBRARY
- LOCATE NAMES OF INDIVIDUALS, FIRMS, AND OTHER INFORMATION IN PHONE BOOKS, DIRECTORIES, ETC.
- INTERPRET GRAPHS, CHARTS DIAGRAMS, AND TABLES ACCURATELY FOR FACTUAL INFORMATION.
- USE PREVIOUS KNOWLEDGE OF ROOTS AND AFFIXES TO DETERMINE THE MEANING OF TECHNICAL VOCABULARY.
- INTERPRET ABBREVIATIONS, CODES, AND OTHER KINDS OF SYMBOLS.
- READ AND COMPREHEND SHORT NOTES, MEMOS, AND LETTERS.
- RESTATE AND IDEA OR CONCEPT FROM TEXTBOOKS, MANUALS, INSTRUCTIONS PAMPHLETS, AND SIMILAR PRINTED MATERIALS.
- IDENTIFY JARGON AND USE CONTEXTUAL CLUES TO IDENTIFY ITS MEANING.
- RECOGNIZE COMPARISON AND CONTRAST IN PRINTED MATERIALS.
- RECOGNIZE CAUSE AND EFFECT STATEMENTS AND BE ABLE TO DISTINGUISH BETWEEN THE TWO.
- DISTINGUISH BETWEEN FACT AND OPINION STATEMENTS.
- READ AND FOLLOW DIRECTIONS AS STATED IN MANUALS, ASSIGNMENT SHEETS, TEXTBOOKS, PAMPHLETS, ETC.
- IDENTIFY CONCLUSIONS, PREDICTIONS, AND SPECULATIONS MADE BY THE AUTHOR.

READING TASKS: STUDENTS WILL--

- MAKE GENERALIZATIONS.
- RECOGNIZE THE SEQUENCE IN PRINTED MATERIAL.
- IDENTIFY SPATIAL ORDER AND BE ABLE TO DETERMINE THE SPATIAL RELATIONSHIP OF ONE OBJECT TO ANOTHER.
- RECOGNIZE MAIN IDEAS AND DETAILS AND BE ABLE TO DISTINGUISH BETWEEN THEM.
- PARAPHRASE THE MAIN IDEA OF A PARAGRAPH.
- IDENTIFY TIME ORDER RELATIONSHIPS.
- IDENTIFY CONCLUSIONS IN WRITTEN COMMUNICATIONS.
- MAKE JUDGEMENTS AND DECISIONS BASED UPON READING.
- MAKE JUDGEMENTS AS TO THE CREDIBILITY OF THE AUTHOR.
- IDENTIFY AND DISTINGUISH BETWEEN EXAMPLES OF SLANTED AND OBJECTIVE WRITING.
- RECOGNIZE METRIC TERMS.
- USE NEW TERMINOLOGY ACQUIRED THROUGH READING.
- SUMMARIZE WRITTEN INFORMATION.
- VARY READING RATE ACCORDING TO THE NATURE AND DIFFICULTY OF THE MATERIALS AND THE PURPOSE FOR READING.

WRITING TASKS

STUDENTS WILL --

- DEVELOP PURPOSEFUL THESIS STATEMENTS.
- PRACTIVE WRITING CONCISELY, CLEARLY, AND SPECIFICALLY.
- USE APPROPRIATE, MEANINGFUL WORK CHOICES IN WRITTEN NARRATIVES.
- DISCRIMINATE BETWEEN STANDARD AND NON-STANDARD ENGLISH IN WRITING OF SELF AND OTHERS.
- PROOFREAD AND EDIT ONE'S OWN AND OTHERS' WRITING ATTENDING TO MECHANCIS AND ORGANIZATION.
- STATE ONE'S POINT OF VIEW, OPINIONS, OR POSITION IN WRITTEN FORM.
- RECOGNIZE AND USE ORGANIZATIONAL PATTERNS IN DEVELOPING TECHNICAL EXPLANATIONS.
- WRITE A CHRONOLOGICAL OUTLINE.
- ORGANIZE IDEAS AND PUT THEM INTO WORDS RAPIDLY IN WRITTEN FORM.
- WRITE A CONCISE DEFINITION OF A TERM.
- DESCRIBE AN OBJECT ACCURATELY IN WRITING.
- WRITE A LOGICAL EXPLANATION OF A PROCESS.
- WRITE A COMPARISON-CONTRAST NARRATIVE OF SPECIFIC OBJECTS.
- LOGICALLY CLASSIFY OBJECTS AND EXPLAIN THEIR RELATIONSHIPS.
- FOLLOW A SPECIFIC FORMAT IN WRITING REPORTS.
- COMPOSE TECHNICAL EXPLANATIONS IN MECHANICALLY CORRECT FORM.
- COMPOSE LOGICAL AND UNDERSTANDABLE WRITTEN CORRESPONDENCE, DIRECTIVES, MEMOS, SHORT NOTES, AND REPORTS.
- WRITE LOGICAL AND UNDERSTANDABLE STATEMENTS, PHRASES, OR SENTENCES TO FILL OUT FORMS ACCURATELY.
- COMPILE ONE'S OWN NOTES TAKEN ON SEVERAL WRITTEN SOURCES INTO A SINGLE REPORT.
- COMPILE IDEAS, NOTES, AND INFORMATION SUPPLIED BY OTHERS INTO A SINGLE REPORT.

INTERPERSONAL RELATIONS

STUDENTS WILL --

- BECOME AWARE OF PERCEPTIONS OF SELF AND OTHERS, HOW THEY INFLUENCE INTERPERSONAL RELATIONS.
- BECOME AWARE OF HOW MOTIVES AFFECT INTERPERSONAL RELATIONS.
- APPRECIATE THE IMPORTANCE OF GIVING AND RECEIVING FEEDBACK FOR EFFECTIVE COMMUNICATION.
- EXPLORE METHODS OF COMMUNICATING EFFECTIVELY.
- SEE THINGS FROM ANOTHER'S POINT OF VIEW.
- INTERPRET FEELINGS, IDEAS, OR FACTS IN TERMS OF ONE'S OWN VIEWPOINT OR VALUES.
- RECOGNIZE ORGANIZATIONAL COMMUNICATIONS METHODS/ PATTERNS.
- BE AWARE OF THE IMPORTANCE OF COOPERATIVE DEMEANOR IN BEING A MEMBER OF A TEAM.
- BECOME AWARE OF THE IMPORTANCE OF GOOD INTERPERSONAL RELATIONS ON THE JOB.
- BECOME AWARE OF FEELINGS AND HOW THEY AFFECT INDIVIDUALS ON THE JOB.
- USE APPROPRIATE QUESTIONS IDENTIFY OR SOLVE A PROBLEM.
- PRACTICE GIVING AND RECEIVING SPOKEN INSTRUCTIONS.
- ANTICIPATE QUESTIONS NECESSARY FOR SUCCESSFUL RESPONSE AS AN INTERVIEWEE.
- DEVELOP AGENDA AND GOALS FOR COMPLETION OF AN INTERVIEW.

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EDUCATION FOR TECHNOLOGY

MATHEMATICS SKILLS

Appendix B

Standards of achievement in basic academic areas including mathematics should be such that the granting of credit and educational advancement would reflect competency in that subject. Each education agency must determine what it regards as the minimal competencies necessary for credit or graduation. Increasing graduation standards per se is not necessarily a real solution to our dilemma. Standards will still be too difficult for some students and relatively easy for the ablest students.

With the advent of competency based education it is possible to identify the specific skills mastered by each student. For vocational training needs, minimal academic competencies must be defined in terms of the specific entry level job reguirements in each academic discipline. For professional workers in high technology industries a strong high school backgound in math and science is essential. Non-professional workers demand varied amounts of math and science training depending upon the "range" of jobs they enter.

Since there appears to be a "range" of mastery required (in any particular subject matter area) individual career planning within this broad range of identified competencies may be critical. For example, in the area of electronics, one could learn to trouble shoot electronic circuits with no knowledge of algebra; tenth grade mathematics is generally regarded as essential to the study of basic electronic theory; and college mathematics is required to complete an electronics technology program. The completion of a basic technical core involving mathematics and applied physics would provide for greater flexibility in future career choices.

MATHEMATICS MASTERY GRADES K THRU 8

ADD, SUBTRACT, MULTIPLY, DIVIDE WHOLE NUMBERS

ADD, SUBTRACT, MULTIPLY, DIVIDE, SIMPLIFY FRACTIONS

ADD, SUBTRACT, MULITPLY, DIVIDE, DECIMALS

CHANGE PERCENTS TO DECIMALS TO FRACTIONS

FIND PERCENTAGES OF NUMBERS

MEASURE TIME

MEASURE DISTANCE (ENGLISH AND METRIC)

SOLVE PROBLEMS USING RATIOS AND PROPORTIONS

DEVELOP BAR, LINE, CIRCLE GRAPHS

FIND AREA, VOLUME, PERIMETER OF TRIANGLES, RECTANGLES, SQUARES AND CUBES

SOLVE SIMPLE ONE AND TWO STEP ALGEBRAIC EQUATIONS

DEVELOP PROBLEM SOLVING SKILLS

MATHEMATICS MASTERY SKILLS ALGEBRA I

APPLY ORDER OF OPERATIONS OF NUMBERS

USE DISTRIBUTIVE PROPERTY

COMBINE LIKE TERMS

APPLY GEOMETRIC FORMULAS TO SQUARES, RECTANGLES, TRIANGLES

ADD, SUBTRACT, MULITPLY, DIVIDE INTEGERS

USE ABSOLUTE VALUE CONCEPTS

SOLVE LINEAR EQUATIONS AND RELATED WORK PROBLEMS (ONE VARIABLE)

SOLVE LINEAR INEQUALITIES (ONE VARIABLE)

GRAPH LINEAR EQUATIONS AND INEQUALITIES ON NUMBER LINE

APPLY EXPONENT CONCEPTS (MULTIPLY, DIVIDE, NEGATIVE)

ADD, SUBTRACT, MULTIPLY, DIVIDE POLYNOMIALS

FACTOR RATIONAL EXPRESSIONS

SIMPLIFY RATIONAL EXPRESSIONS (I.E. POLYNOMIAL FRACTIONS)

ADD, SUBTRACT, MULTIPLY, DIVIDE RATIONAL EXPRESSIONS

SOLVE RATIONAL EXPRESSION EQUATIONS

USE IDEAS OF SLOPE AND INTERCEPT ON CARTESIAN PLANE

GRAPH LINEAR EQUATIONS AND INEQUALITIES ON CARTESIAN PLANE

SOLVE SYSTEMS OF SIMULTANEOUS LINEAR EQUATIONS USING GRAPHING, SUBSTITUTION, LINEAR COMBINATION (2 OR MORE VARIABLES)

APPLY RELATION AND FUNCTION CONCEPTS

ADD, SUBTRACT, MULTIPLY, DIVIDE, SIMPLIFY RADICALS

APPLY PYTHAGOREAN THEOREM

SOLVE RADICAL (IRRATIONAL) EQUATIONS

APPLY QUADRATIC FORMULA

SOLVE QUADRATIC EQUATIONS USING FACTORING, COMPLETE THE SQUARE, FORMULA

MATHEMATICS MASTERY TAUGHT IN ALGEBRA II

Note: To provide for more flexibility in vocational education programming it is recommended that these skills be mastered in the tenth grade.

ADD, SUBTRACT, MULTIPLY, DIVIDE, SIMPLIFY EXPONENTS

FACTOR QUADRATIC TRINOMIALS

SOLVE QUADRATIC EQUATIONS USING FORMULA, COMPLETE SQUARE, FACTORING

SIMPLIFY RATIONAL EXPRESSIONS

SOLVE RATIONAL AND IRRATIONAL EQUATIONS

APPLY COORDINATE GEOMETRY ON CARTESIAN PLANE

DEVELOP SYNTHETIC DIVISION TECHNIQUE

ADD, SUBTRACT, MULTIPLY, DIVIDE COMPLEX NUMBERS

SOLVE QUADRATIC EQUATIONS CONTAINING COMPLEX NUMBERS

GRAPH RELATIONS AND FUNCTIONS ON CARTESIAN PLANE

SOLVE SIMULTANEOUS SYSTEMS OF LINEAR EQUATIONS

IDENTIFY ARITHEMETIC AND GEOMETRIC SERIES AND SEQUENCES

DEVELOP BINOMIAL EXPANSION TECHNIQUE

SOLVE LOGARITHMIC EXPRESSIONS

INTERPOLATE LOGARITHMS

DEVELOP PROBLEM SOLVING TECHNIQUES OVER PERMUTATIONS, COMBINATIONS, AND PROBABILITY

INTRODUCE BASIC TRIG FUNCTIONS AND CONCEPTS

MATHEMATICS MASTERY SKILLS TAUGHT IN GEOMETRY

Note: Useful to not required

DEVELOP A LOGICAL, PROBLEM SOLVING, TECHNIQUE

INTRODUCE BASIC GEOMETIC CONCEPTS USING POINTS, LINES SEGMENTS AND ANGLES

DEVELOP BASIC CONSTRUCTIONS

DEVELOP CONCEPT OF POSTULATES AND THEOREMS

DEVELOP DIFINITIONS FOR ALL NEW CONCEPTS

DEVELOP FORMAL PROOF FORMAT OF DIRECT PROOF

DEVELOP FORMAL PROOF FORMAT OF INDIRECT PROOF

IDENTIFY BASIC PAIRS OF ANGLES (COMPLEMENTARY, SUPPLEMENTARY, VERTICAL)

DEVELOP THEOREMS OVER PAIRS OF ANGLES

APPLY GEOMETRY TO PRACTICAL SITUATIONS

IDENTIFY PARALLEL LINES AND RELATED ANGLE PAIRS

DEVELOP THEOREMS AND CONVERSE THEOREMS OVER PARALLEL LINES

IDENTIFY THE PARALLEL POSTULATE

CLASSIFY TRIANGLES ACCORDING TO ANGLES AND SIDES

DEVELOP POSTULATES AND THEOREMS OVER CONGRUENCE OF TRIANGLE

DEVELOP THEOREMS OVER POLYGONS

DEVELOP THEOREMS OVER QUADRILATERALS (RECTANGLE, RHOMBUS, PARALLELOGRAM, SQUARE, TRAPEZOID, ISOSCELES TRAPEZOID)

DEVELOP THEOREMS OVER SIMILARITY OF TRIANGLES

USE PYTHAGOREAN THEOREM AND SPECIAL LIGHT TRIANGLE THEOREMS (30-60-90, 45-45-90)

DEVELOP GEOMETRY OF A CIRCLE AND RELATED THEOREMS

IDENTIFY INEQUALITY IN TRIANGLES

USE FORMULAS FOR AREA AND VOLUME OF ALL GEOMETRIC FIGURES

DEVELOP COORDINATE GEOMETRY

IDENTIFY LOCUS OF POINTS, EQUIDISTANCE, ALTITUDES, MEDIANS, BISECTORS

MATHEMATICS MASTERY SKILLS TAUGHT IN BASIC TRIGONOMETRY

IDENTIFY ROTATION OF ANGLES (POSITIVE AND NEGATIVE)

SOLVE 30-60-90, 45-45-90 RIGHT TRIANGLE PROBLEMS

DEVELOP SINE, COSINE, TANGENT, COTANGENT, SECANT, COSECANT FUNCTIONS USING POSITIVE AND NEGATIVE ANGLES

USE TRIG TABLES TO FIND ANGLES AND CONVERSE FIND TRIG VALUE

USE CALCULATOR TO FIND TRIG VALUES

SOLVE TRIG EQUATIONS

INTERPOLATE TRIG TABLES

DEVELOP THE TRIGONOMETRY OF A RIGHT TRIANGLE

FIND THE LOGS OF TRIG FUNCTIONS

SOLVE QUADRATIC EQUATIONS CONTAINING TRIG FUNCTIONS

IDENTIFY THE TRIG IDENTITIES

DEVELOP RADIAN MEASURE OF ANGLES

IDENTIFY THE INVERSE TRIG FUNCTIONS

DEVELOP TANGENT, SINE, COSINE, LAWS AND FORMULAS

DEVELOP HALF-ANGLE FORMULAS

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MECHANICAL DRAFTING CURRICULUM

Appendix C

THE INTENT OF THE MECHANICAL DRAFTING CURRICULUM IS.....

1) To provide job entry level skills for those planning be employed as drafting technicians

2) To offer a solid foundation in mechanical drafting for those pursuing a 2 or 4 year degree

3) To provide for the upgrading of skills for those already in the work force

The identified learning tasks progress from competencies in basic geometric construction through layout and design with the basic skills covered at the secondary level and advanced concepts presented at the post secondary level. Individual assessment and counseling indicates at which level entering students begin their study, while career goals determine when they exit. A task listing keeps track of the students progress through the curriculum.

While the task list only addresses the required basic math skills it must be stressed that the students enroll in secondary and post secondary support courses in math, computers, sciences and related technologies to enhance their program of study.

DRAFTING RELATED MATH

- ADD SUBTRACT MULTIPLY DIVIDE WHOLE NUMBERS
- ADD SUBTRACT MULTIPLY DIVIDE DECIMALS
- ADD SUBTRACT MULTIPLY DIVIDE FRACTIONS
- ADD SUBTRACT MULTIPLY DIVIDE MIXED NUMBERS
- CONVERT FRACTIONS TO DECIMALS
- CORRECTLY USE A DECIMAL TO FRACTION CONVERSION CHART
- SOLVE PROBLEMS USING PERCENTAGES
- CALCULATE AREA AND VOLUME
- USE SINE, COSINE AND TANGENT FUNCTIONS TO SOLVE TRIGOMETRIC PROBLEMS
- USE THE PYTHAGOREAN THEOREM TO SOLVE TRIGONOMETRIC PROBLEMS

INTRODUCTION TO:
MECHANICAL DRAFTING

- PRODUCE BASIC FREEHAND TECHNICAL SKETCHES
- IDENTIFY DRAFTING EQUIPMENT FOUND IN A TYPICAL DRAFTING ROOM
- USE TRADITIONAL DRAFTING EQUIPMENT TO PRODUCE SINGLE VIEW DRAWINGS
- SET UP AND ALIGN A MULTI-SCALE DRAFTING STATION
- IDENTIFY AND DEMONSTRATE APPROPRIATE LINE QUALITY
- NEATLY PRODUCE VARIOUS SIZED LETTERING AND NUMERICAL STYLES
- CONVERT U.S. MEASUREMENTS TO METRICS AND METRICS TO U.S. MEASUREMENTS
- ENLARGE OR REDUCE GIVEN DIMENSIONS TO REQUIRED SCALE
- DISTINGUISH DRAFTING MEDIUM OF PAPERS, CLOTHS AND POLYESTERS
- USE DRAFTING EQUIPMENT TO PRODUCE BASIC GEOMETRIC CONSTRUCTIONS
- COMPLETE THE VIEWS OF GIVEN MULTI-VIEW PROJECTION DRAWINGS
- DIMENSION BASIC GEOMETRIC SHAPES
- DIMENSION INTRODUCTORY MULTI-VIEW DRAWINGS
- CONSTRUCT BASIC SECTION DRAWINGS
- CONSTRUCT PRIMARY AUXILIARY VIEW DRAWINGS
- APPLY TOLERANCES TO DIMENSIONED DRAWINGS
- IDENTIFY GEOMETRIC FORM AND POSITION SYMBOLS
- CONSTRUCT STANDARD THREADS AND FASTENERS
- DEVELOP SHEET METAL INTERSECTIONS
- CONSTRUCT SIMPLE ISOMETRIC DRAWINGS
- CONSTRUCT A CAM PROFILE AND FOLLOWER DRAWING

INTRODUCTION TO MECHANICAL DRAFTING: cont.

- CONSTRUCT A SPUR GEAR DRAWING
- LAYOUT AN ASSEMBLY DRAWING
- IDENTIFY ELECTRONIC COMPONENT SYMBOLS
- LAYOUT A SCHEMATIC ELECTRONIC DRAWING
- CONSTRUCT A BASIC MULTI-VIEW DRAWING USING INKING INSTRUMENTS
- IDENTIFY PIPING DRAWING COMPONENT SYMBOLS
- LAYOUT A PIPING SCHEMATIC DRAWING
- IDENTIFY OPERATIONS PERFORMED ON TYPICAL MACHINE TOOLS

INTRODUCTION TO:
THE COMPUTER AIDED DRAFTING (CAD) SYSTEMS

- DESCRIBE MAN/MACHINE INTERFACE
- DEFINE CAD APPLICATIONS
- DESCRIBE CAD SYSTEM ARCHITECTURE
- IDENTIFY COMPONENTS OF A CAD WORKSTATION
- IDENTIFY CAD CENTRAL PROCESSING EQUIPMENT
- DESCRIBE PERIPHERAL CAD EQUIPMENT
- IDENTIFY SYSTEM OPERATING MODES
- DIFFERENTIATE DRAWING FILE DICTIONARY, LIBRARY AND DRAWING DATA
- DESCRIBE COMMAND PROCESSES
- USE COMMAND ENTRY INPUT DEVICES
- BOOT CAD SYSTEM
- LOG ON/OFF CAD SYSTEM
- LOAD DRAWING STORAGE FILE
- MANAGE DRAWING SYSTEM FILES
- USE CAD OPERATING MODES

INTRODUCTION TO: TWO DIMENSIONAL (CAD)

- SELECT APPROPRIATE GEOMETRY
- SET UP TWO DIMENSIONAL GRID SYSTEM
- ENTER LINES
- ENTER ARCS
- ENTER FILLETS
- DEVELOP INTERSECTIONS
- ENTER GEOMETRIC DESCRIPTIONS
- MANIPULATE GEOMETRIC SHAPES
- ESTABLISH INCREMENTAL AND CARTESIAN COORDINATES
- ROTATE GEOMETRIC SHAPES

TWO DIMENSIONAL (CAD) cont.

- COPY GEOMETRIC SHAPES
- MIRROR GEOMETRIC SHAPES
- ZOOM IN/OUT ON GEOMETRIC SHAPES
- SELECT CHARACTER SET
- DISPLAY TEXT
- EDIT TEXT
- MANIPULATE TEXT
- ENTER DIMENSIONS USING CONVENTIONAL DIMENSIONING STANDARDS
- USE BASELINE DIMENSIONING
- MODIFY DIMENSIONS
- CONSTRUCT GEOMETRIC DIMENSIONING SYMBOLS
- IDENTIFY DIGITIZING COMMANDS
- DEFINE DIGITIZING TABLET AREA
- ADD GEOMETRIC COMPONENTS USING TABLET
- DESIGN A COMPONENT LIBRARY
- ENTER COMPONENT CELLS
- MANIPULATE COMPONENT CELLS
- DISPLAY DISTANCES, ANGLES AND LOCATIONS
- EXECUTE SCREEN DUMP COMMANDS
- EXECUTE PLOTTING COMMANDS

INTRODUCTION TO: THREE DIMENSIONAL (CAD)

- SELECT 3D GRAPHIC SYSTEM MEASUREMENT UNITS
- DEFINE THE VIEW CUBE
- MANIPULATE THE VIEW CUBE
- SAVE AND GET VIEWS
- SELECT QUANTITY AND TYPE OF VIEWS

THREE DIMENSIONAL (CAD) cont.

- SET UP VARIOUS 3D GRID SYSTEMS
- SET DRAWING LEVELS USING COMPONENTS
- CREATE 3D OBJECTS
- LOCATE CUTTING PLANES
- PROJECT GEOMETRY TO A PLANE
- USE A CAD SYSTEM TO PRODUCE SPECIFIC DRAWINGS/SCHEMATICS

ADVANCED MECHANICAL DRAFTING & DESIGN

- DEVELOP A RECOGNIZABLE NUMERIC AND LETTERING STYLE
- LAYOUT COMPLEX GEOMETRIC CONSTRUCTIONS
- USE ANSI STANDARDS TO DIMENSION COMPOSITE GEOMETRIC SHAPES
- USE ANSI STANDARDS TO DIMENSION MULTI MACHINED PARTS
- LAYOUT DRAWINGS ILLUSTRATING MULTIPLE MATERIALS IN SECTION
- CONSTRUCT A DETAILED ASSEMBLY REQUIRING MULTIPLE SECTIONS
- LAYOUT PRIMARY AND SECONDARY AUXILIARY VIEWS DETAILING COMPOUND OBLIQUE SURFACES
- DETERMINE TOLERANCES TO REFLECT SPECIFIC FIT CHARACTERISTICS
- DEVELOP TOLERANCES USING THE CONCEPTS OF MAXIMUM MATERIAL CONDITION, LEAST MATERIAL CONDITION AND REGARDLESS OF FEATURE SIZE
- DESIGN THREADS AND FASTENERS TO MEET LOAD REQUIREMENTS
- IDENTIFY MACHINE TOOLS REQUIRED TO ACHIEVE A SPECIFIC SHAPE
- LAYOUT AN EXPLOADED ISMOETRIC DETAILING MULTIPLE PARTS
- IDENTIFY THE DESIGN STAGE PROCESSES
- LAYOUT A CYLINDRICAL CAM DISPLACEMENT DIAGRAM THAT PRODUCES SPECIFIC COMPOUND MOTIONS
- CONSTRUCT A CAM FOLLOWER DRAWING THAT REPRESENTS SPECIFIC MOTIONS
- CONSTRUCT AN AXONOMETRIC PROJECTION THAT DETAILS A COMPOSIT OBLIQUE ANGLE
- DETERMINE DESIGN DATA FOR A SPUR, BEVEL AND WORM GEARS
- LAYOUT BEVEL, SPUR AND WORM GEAR DRAWINGS REFLECTING SPECIFIC ENGAGEMENT CHARACTERISTICS

ADVANCED MECHANICAL DRAFTING & DESIGN: cont.

- LAYOUT MULTIPLE PULLEYS TO TRANSFER POWER AT SPECIFIC RPM
- SIZE PULLEYS AND BELTS TO MEET POWER REQUIREMENTS
- INVESTIGATE CLUTCH MECHANISMS
- DESIGN FUNCTIONAL INSPECTION GAUGES
- SIZE CHAINS AND SPROCKETS TO MEET POWER REQUIREMENTS
- LAYOUT CHAINS AND SPROKETS TO REFLECT DESIGN CRITERIA
- SELECT BEARINGS TO SUPPORT REQUIRED LOADS
- LAYOUT BEARINGS TO REFLECT DESIGN DATA
- LAYOUT A ELECTRONIC CHASIS FABRICATION DRAWING
- LAYOUT A MULTIPLE CIRCUIT ELECTRONIC SCHEMATIC
- LAYOUT A SINGLE LINE ELECTRONIC DIAGRAM
- LAYOUT A PRINTED CIRCUIT MASTER DRAWING USING ADHESIVE TAPE
- CONSTRUCT AN ISOMETRIC PIPING LAYOUT
- LAYOUT HYDRAULIC/PNEUMATIC COMPONENTS TO REFLECT REQUIRED MOTION

ENGINEERING GRAPHICS

- DETERMINE VISIBILITY
- DETERMINE TRUE LENGTH OF LINE
- DETERMINE TRUE SIZE OF PLANE
- DETERMINE BEARING ANGLE
- CALCULATE SLOPE AND GRADE
- DETERMINE PIERCING POINT OF A LINE & PLANE
- DEVELOP PICTORIAL INTERSECTIONS
- MEASURE DIHEDRAL ANGLES
- CONSTRUCT A CONTOUR MAP
- SOLVE MECHANICS PROBLEMS USING VECTOR GRAPHICS
- CONSTRUCT DEVELOPMENTS OF SOLID FIGURES
- SOLVE PROBLEMS USING PARALLELISM CONCEPTS
- SOLVE PROBLEMS USING PERPENDICULARITY CONCEPTS

JIG AND FIXTURE DESIGN

- LIST THE OBJECTIVES OF TOOL DESIGN
- IDENTIFY THE SOURCE OF SPECIFIED DESIGN DATA
- IDENTIFY THE CLASSES OF JIGS AND FIXTURES
- IDENTIFY THE TYPES OF JIGS AND FIXTURES
- CHOOSE A CLASS AND TYPE OF JIG OR FIXTURE FOR SELECTED OPERATIONS ON SAMPLE PARTS
- IDENTIFY THE TYPES OF LOCATORS AND SUPPORTS USED FOR JIGS AND FIXTURES
- SPECIFY THE USE OF LOCATORS AND SUPPORTS
- ANALYZE SAMPLE PARTS AND SELECT THE LOCATING AND SUPPORTING DEVICES BEST SUITED FOR EACH
- EXPLAIN THE BASIC PRINCIPLES OF WORKHOLDERS
- IDENTIFY THE TYPES OF WORKHOLDING DEVICES
- MATCH THE CHARACTERISTICS AND APPLICATIONS TO A PARTICULAR TYPE OF CLAMPING DEVICE
- IDENTIFY THE CHARACTERISTICS OF TOOL BODIES
- IDENTIFY VARIOUS DRILL BUSHINGS
- DESCRIBE THE PROPER PLACEMENT AND CLEARANCE FOR DRILL BUSHINGS
- IDENTIFY COMMON JIG AND FIXTURE HARDWARE
- IDENTIFY AND DEFINE THE PRINCIPLES OF DESIGN ECONOMY
- COMPLETE AN ECONOMIC ANALYSIS OF A TOOL DESIGN
- DESCRIBE HOW THE DESIGNS FOR JIGS AND FIXTURES ARE PLANNED
- LIST THE HUMAN FACTORS INVOLVED IN TOOL DESIGN
- LIST THE SAFETY FACTORS RELATED TO TOOL DESIGN
- IDENTIFY THE TYPES OF TOOL DRAWINGS
- SPECIFY METHODS TO SIMPLIFY TOOL DRAWINGS
- IDENTIFY DIMENSIONAL FORMS

JIG AND FIXTURE DESIGN

- SPECIFY THE RULES OF METRIC DIMENSIONING
- ANALYZE PART DATA TO DETERMINE SUITABLE TOOL DESIGNS
- SPECIFY LOCATING AND SUPPORTING METHODS, AND THE TOOLS TO SUIT A SAMPLE PART
- DESIGN A SUITABLE TEMPLATE JIG FOR A SAMPLE PART
- COMPLETE A TOOL DRAWING OF A PROPOSED TOOL TO ACCOMPLISH SPECIFIC TASKS
- ANALYZE PART DATA TO DETERMINE SUITABLE TOOL DESIGNS
- SPECIFY LOCATING, SUPPORTING, AND CLAMPING METHODS, AND DETAILS TO SUIT SPECIFIC SAMPLE PARTS
- ANALYZE REQUIREMENTS, CALCULATE, AND DESIGN A CAM-ACTION CLAMP TO HOLD A WORKPIECE IN A FIXTURE
- DESIGN A SUITABLE VISE-HELD FIXTURE AND COMPLETE THE REQUIRED TOOL DRAWINGS
- DESIGN A SUITABLE PLATE FIXTURE AND COMPLETE THE REQUIRED TOOL DRAWINGS
- ANALYZE PART DATA TO DETERMINE SUITABLE JIG TYPES TO PERFORM SPECIFIED TASKS
- SPECIFY LOCATING, SUPPORTING, AND CLAMPING METHODS AND DETAILS TO SUIT SAMPLE PARTS
- DESIGN TWO PLATE-TYPE JIGS TO SUIT SPECIFIED SAMPLE PARTS, AND CONSTRUCT THE REQUIRED TOOL DRAWINGS
- ANALYZE PART DATA TO DETERMINE SUITABLE TOOL DESIGNS
- SPECIFY LOCATING, SUPPORTING, AND CLAMPING METHODS TO SUIT SPECIFIED SAMPLE PARTS
- DESIGN ONE ANCLE-PLATE JIG AND ONE ANGLE-PLATE FIXTURE TO SUIT SPECIFIED SAMPLE PARTS
- ANALYZE PART DATA TO DETERMINE SUITABLE TOOL DESIGNS

JIG AND FIXTURE DESIGN

- SPECIFY LOCATING, SUPPORTING, AND CLAMPING METHODS AND DETAILS TO SUIT SAMPLE PARTS
- DETERMINE THE SPECIFIC TYPE OF JIG REQUIRED, AND DESIGN A TOOL, TO SUIT A SAMPLE PART
- CONSTRUCT THE REQUIRED TOOL DRAWINGS
- ANALYZE PART DATA TO DETERMINE SUITABLE TOOL DESIGNS
- SPECIFY LOCATING AND SUPPORTING METHODS AND DETAILS TO SUIT SAMPLE PARTS
- DESIGN ONE VISE-JAW JIG AND ONE VISE-JAW FIXTURE TO SUIT SPECIFIED SAMPLE PARTS
- SPECIFY THE ADVANTAGES AND APPLICATIONS OF MODULAR TOOLING
- IDENTIFY THE BASIC DESIGN OBJECTIVES FOR WELDING FIXTURES
- LIST THE FUNCTIONS AND BASIC DESIGN CONSIDERATIONS OF NUMERICAL CONTROL
- IDENTIFY THE TYPES AND APPLICATIONS OF INSPECTION TOOLING
- DESCRIBE THE PROPERTIES AND APPLICATIONS OF CARBON AND TOOL STEELS
- DEFINE THE CHARACTERISTICS AND APPLICATIONS OF NONFERROUS METALS
- DESCRIBE THE PROPERTIES AND USES OF NONMETALLIC TOOL MATERIALS
- DESIGN A LEAF JIG
- DESIGN A ONE WAY DRILL JIG
- DESIGN A FLOP JIG
- DESIGN A PUMP JIG
- DESIGN A LOCATING BROACH FIXTURE
- DESIGN A WELDED MILLING FIXTURE
- DESIGN A LATHE FIXTURE

DIE DESIGN

- DESIGN A DROP THRU BLANKING DIE
- DESIGN A RETURN TYPE BLANKING DIE
- DESIGN A BLANK & PIERCE DIE
- DESIGN A PIERCE & CUT-OFF DIE
- DESIGN A CAM TYPE TRIM & PIERCE DIE
- DESIGN A SINGLE ACTION DIE
- DESIGN A DOUBLE ACTION DIE
- DESIGN A CAM FORM DIE

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ELECTRONICS CORE CURRICULUM

Appendix D

The Electronics Technology field has grown by leaps and bounds in the past decade. Trends in the filed offer mulitiple varied possibilities for employment--computer maintenance, instrumentation, automated manufacturing, bio-med technician, etc.

In the past a person specializing in Electronics usually ended with training in servicing specific electronic equipment. Today the Electronic Specialist must have a broad knowled e in several areas and almost all of the applications share the same basic core of knowledge including direct current, alternating current, semi-conductors, electronic circuits, micro-processors, etc.

The task list which has been developed represents an articulated core of learning tasks which are basic to electronics technology training. This basic core begins at the secondary level along with other technical subjects. It is then articulated with other basic applied electronics topics and the specialized courses at the college level which are essential to employability as an electronics specialist/ technician.

However, implementation so that the whole educational process becomes an individualized unbroken learning flow without duplication of effort demands regular open communication and review by both secondary and college level personnel.

It must also be emphasized that each student must also have those science, mathematics, and computer skills which are essential to advanced training in the electronics field.

ELECTRICITY/ELECTRONICS TASK LIST

TASK	DESCRIPTION	M.P.O.
1.	EXPLORE SCIENTIFIC NOTATION	
		A. CONVERT INTO POWERS OF TEN
		B. CONVERT NUMBERS INTO DECIMALS
		C. CONVERT NUMBERS INTO PREFIXED FORM
2.	WORKING WITH POWERS OF TEN	
		A. ADD POWERS OF TEN
		B. SUBTRACT POWERS OF TEN
		C. DIVIDE POWERS OF TEN
		D. MULITIPLY POWERS OF TEN
		E. POWERS AND ROOTS OF POWER OF TEN
3.	EXPLORE THE STRUCTURE OF THE ATOM	
		A. EXPLORE NEGATIVE AND POSITIVE POLARITIES
		B. EXPLORE ELECTRONS AND PROTONS
		C. EXPLORE THE STRUCTURE OF THE MODEL OF THE ATOM
4.	EXPLORE THE NATURE OF ELECTRICITY	
		A. EXAMINE THE COULOMB UNIT OF CHARGE
		B. EXAMINE THE VOLT UNIT OF POTENTIAL DIFFERENCE
		C. EXAMINE CHARGE IN MOTION-CURRENT
		D. EXAMINE OPPOSITION TO CHARGE IN MOTION
		E. IDENTIFY A CLOSED CIRCUIT
		F. IDENTIFY SOURCES OF ELECTRICITY-DRY CELLS, BENCH SUPPLIES, SIGNAL GENS, X PACERS, etc...
5.	IDENTIFY TYPES OF CONDUCTORS AND INSULATORS	
		A. EXAMINE THE FUNCTIONS OF CONDUCTORS
		B. EXAMINE WIRE GAUGE SIZE
		C. EXPLORE PRINTED CIRCUITS
		D. EXAMINE WIRE RESISTANCE
		E. EXPLORE TEMPERATURE CO-EFFICIENTS
		F. EXAMINE INSULATORS

ELECTRICITY/ELECTRONICS TASK LIST
DIRECT CURRENT (CONTINUED)

TASK	DESCRIPTION	M.P.O.
6.	IDENTIFY AND EXPLORE PARTS OF A CIRCUIT	
		A. EXAMINE SPST, SPDT, DPST, DPDT SWITCHES
		B. EXAMINE FUSES
		C. EXPLORE PILOT LIGHTS
		D. PERFORM EXPERIMENT ON OPEN AND CLOSED CIRCUITS
7.	EXPLORE AND EXAMINE RESISTORS	
		A. DEFINE RESISTANCE
		B. EXPLORE TYPES OF RESISTORS (CARBON, WIRE WOUND, FILM AXIAL)
		C. FIGURE VALUE OF RESISTORS WITH COLOR CODE
		D. EXAMINE POWER RATINGS OF RESISTORS
		E. EXAMINE VARIABLE RESISTORS
		F. EXPLORE POTENTIOMETERS AND RHEOSTATES
		G. EXPLORE CONSIDERATIONS FOR A RESISTOR IN A CIRCUIT
		H. EXAMINE RESISTORS TROUBLE
8.	OPERATE AND INTERPRETATION OF AN OHMMETER	
		A. EXPLORE THE FUNCTIONS OF AN ANALOG OHMMETER
		B. EXPLORE THE RANGE SWITCH
		C. EXAMINE THE OHMMETER SCALE
		D. EXPLORE SCALE INTERPRETATION
		E. PERFORM EXPERIMENT ON USING OHMMETER
9.	EXPLORE BATTERIES	
		A. IDENTIFY FUNCTIONS OF BATTERIES
		B. IDENTIFY AND EXPLORE THE BASIC TYPES OF BATTERIES - LEAD ACID, CARBON DRY CELLS
		C. EXPLORE SERIES AND PARALLEL CELL CONNECTIONS
10.	OPERATE AND INTERPRETATION OF A D.C. VOLTMETER	
		A. EXPLORE THE FUNCTIONS OF AN ANALOG DC VOLTMETER
		B. EXPLORE THE RANGE SWITCH
		C. EXPLORE AND EXAMINE THE VOLTMETER SCALE
		D. EXPLORE SCALE INTERPRETATION
		E. PERFORM EXPERIMENT ON USING THE VOLTMETER

ELECTRICITY/ELECTRONICS TASK LIST
DIRECT CURRENT (CONTINUED)

TASK	DESCRIPTION	M.P.O.
11.	EXPLORE THE OPERATION OF A VARIABLE OF DC POWER SUPPLY	
		A. EXPLORE THE OPERATION OF A VARIABLE DC POWER SUPPLY
		B. PERFORM EXPERIMENT ON USING A VARIABLE DC POWER SUPPLY
12.	OPERATE AND INTERPRETATION OF A DC AMP METER	
		A. EXPLORE THE FUNCTIONS OF AN ANALOG DC AMP METER
		B. EXPLORE THE RANGE SWITCH
		C. EXAMINE AND INTERPRET THE AMP METER SCALE
		D. EXAMINE HOOK-UP PROCEDURES OF A AMP METER
		E. PERFORM EXPERIMENT ON USING A DC AMP METER
13.	WORKING WITH OHM'S LAW	
		A. SOLVE FOR CURRENT
		B. SOLVE FOR VOLTAGE
		C. SOLVE FOR RESISTANCE
		D. EXPLORE THE LINEAR PROPORTION BETWEEN VOLTAGE AND CURRENT
		E. SOLVING PROBLEMS WITH MULTIPLE AND SUBMULTIPLE UNITS
		F. PERFORM EXPERIMENT CONFIRMING OHM'S LAW
14.	WORKING WITH THE POWER LAW	
		A. SOLVE FOR POWER
		B. SOLVE FOR CURRENT
		C. SOLVE FOR VOLTAGE
		D. EXAMINE POWER IN SERIES AND PARALLEL CIRCUITS
		E. PERFORM EXPERIMENT CONFIRMING THE POWER LAW
15.	SOLVING SERIES CIRCUIT PROBLEMS	
		A. EXPLORE CURRENT IN A SERIES CIRCUIT
		B. EXPLORE VOLTAGE IN A SERIES CIRCUIT
		C. EXPLORE RESISTANCE IN A SERIES CIRCUIT
		D. EXPLORE POWER IN A SERIES CIRCUIT
		E. SOLVE SERIES CIRCUIT PROBLEMS
		F. PERFORM EXPERIMENT ON SIMPLE SERIES CIRCUIT

ELECTRICITY/ELECTRONICS TASK LIST
DIRECT CURRENT.(CONTINUED)

TASK	DESCRIPTION	M.P.O.
16.	ANALYZING DIFFERENT SERIES CIRCUITS	
		A. EXAMINE POLARITIES IN A SERIES CIRCUIT
		B. EXAMINE SERIES AIDING AND SERIES OPPOSING VOLTAGE IN A SERIES CIRCUIT
		C. EXAMINE MOVING GROUND AROUND IN A SERIES CIRCUIT
		D. ANALYZING SERIES CIRCUIT PROBLEMS
		E. ANALYZING THE EFFECTS OF OPENS AND SHORTS IN A SERIES CIRCUIT
		F. PERFORM EXPERIMENT ON COMPLEX SERIES CIRCUIT
17.	SOLVING PARALLEL CIRCUITS	
		A. EXPLORE CURRENT IN A PARALLEL CIRCUIT
		B. EXPLORE VOLTAGE IN A PARALLEL CIRCUIT
		C. EXPLORE RESISTANCE IN A PARALLEL CIRCUIT
		D. EXPLORE POWER IN A PARALLEL CIRCUIT
		E. SOLVING PARALLEL CIRCUIT PROBLEMS
		F. PERFORM EXPERIMENT ON SIMPLE PARALLEL CIRCUITS
18.	ANALYZING PARALLEL CIRCUITS PROBLEMS	
		A. ANALYZING THE EFFECTS OF OPEN AND SHORTS IN A PARALLEL CIRCUIT
		B. ANALYZING PARALLEL CIRCUIT PROBLEMS
		C. PERFORM EXPERIMENT
19.	ANALYZING SERIES - PARALLEL CIRCUITS	
		A. SOLVING FOR TOTAL RESISTANCE
		B. EXPLORE RESISTANCE STRINGS IN PARALLEL
		C. EXPLORE RESISTANCE BRANCHES IN PARALLEL
		D. EXPLORE RESISTANCE STRINGS AND BRANCHES IN SERIES-PARALLEL
		E. ANALYZING SERIES-PARALLEL CIRCUITS
		F. PERFORM EXPERIMENT ON PARALLEL CIRCUITS

ELECTRICITY/ELECTRONICS TASK LIST
DIRECT CURRENT (CONTINUED)

TASK	DESCRIPTION	M.P.O.
20.	ANALYZING SERIES-PARALLEL NETWORKS	
		A. EXPLORE THE WHEATSTONE BRIDGE
		B. ANALYZING OPENS AND SHORTS IN SERIES-PARALLEL NETWORKS
		C. EXPLORE VOLTAGE TO CHASSIS GROUND CONNECTIONS
		D. PERFORM EXPERIMENT ON SERIES PARALLEL NETWORKS
21.	EXPLORE VOLTAGE DIVIDERS AND CURRENT DIVIDERS	
		A. EXPLORE SERIES VOLTAGE DIVIDERS
		B. EXPLORE CURRENT DIVIDERS
		C. EXPLORE SERIES VOLTAGE DIVIDERS WITH PARALLEL LOAD CURRENTS
		D. PERFORM EXPERIMENT ON VOLTAGE DIVIDERS
22.	DESIGNING A VOLTAGE/CURRENT DIVIDER	
		A. EXPLORE THE DESIGN OF A LOADED VOLTAGE/CURRENT DIVIDER
		B. DESIGN A LOADED VOLTAGE/CURRENT DIVIDER
		C. PERFORM EXPERIMENT ON DESIGNING A VOLTAGE DIVIDER
23.	EXAMINE METERS	
		A. EXPLORE THE MOVING COIL
		B. EXAMINE THE MEASUREMENT OF METER CURRENT
		C. EXPLORE METER SHUNTS
		D. ANALYSIS OF THE UNIVERSAL SHUNT
		E. ANALYSIS OF THE VOLTMETER
		F. EXPLORE THE LOADING EFFECTS
		G. EXPLORE METER APPLICATIONS
		H. PERFORM EXPERIMENT ON VOLTMETER CONSTRUCTION
24.	SOLVE NETWORKS WITH MESH CURRENTS (2 OR 3 MESHES)	
		A. EXPLORE MESH CURRENTS METHOD
		B. SOLVE NETWORKS USING MESH CURRENTS
		C. PERFORM EXPERIMENT ON MESH CURRENTS
25.	SOLVE NETWORKS WITH SUPERPOSITION (3 OR 4 SOURCES)	
		A. EXPLORE SUPERPOSITION METHOD
		B. SOLVE NETWORKS USING SUPERPOSITION METHOD
		C. PERFORM EXPERIMENT ON SUPERPOSITION

ELECTRICITY/ELECTRONICS TASK LIST
DIRECT CURRENT (CONTINUED)

TASK	DESCRIPTION	M.P.O.
26.	SOLVE NETWORKS WITH THEVENINS THEORM	
		A. EXPLORE THEVENINS THEORM
		B. SOLVE NETWORKS USING THEVENINS THEROM
		C. SOLVE CIRCUITS WITH TWO VOLTAGE SOURCES
		D. SOLVE A BRIDGE CIRCUIT USING THEVENINS THEORM
		E. PERFORM EXPERIMENT ON THEVENINS THEORM
27.	SOLVE NETWORKS WITH NORTONS THEORM	
		A. EXPLORE NORTONS THEORM
		B. SOLVE NETWORKS USING NORTONS THEORM
		C. EXPLORE THEVENINS-NORTONS CONVERSION
		D. EXPLORE CONVERSION OF VOLTAGE AND CURRENT SOURCES
28.	SOLVE NETWORKS WITH MILLMAN'S THEORM	
		A. EXPLORE MILLMAN'S THEORM
		B. SOLVE NETWORKS USING MILLMAN'S THEORM
29.	SOLVE NETWORKS USING NODE VOLTAGE ANALYSIS (2 OR 3 NODES)	
		A. EXPLORE NODE VOLTAGE ANALYSIS
		B. SOLVE NETWORKS USING NODE VOLTAGE ANALYSIS
30.	SOLVE NETWORKS Y AND DELTA CONVERSIONS	
		A. EXPLORE Y AND DELTA CONVERSIONS
		B. SOLVE NETWORKS USING Y AND DELTA CONVERSIONS
		C. PERFORM EXPERIMENT ON DELTA AND Y CONVERSIONS
31.	PLANOR AND NONPLANOR CIRCUIT ANALYSIS	
		A. EXPLORE PLANOR CIRCUITS
		B. SOLVE PLANOR CIRCUITS
		C. EXPLORE NON-PLANOR CIRCUITS
		D. SOLVE NON-PLANOR CIRCUITS
		E. PERFORM EXPERIMENT CONFIRMING PLANOR AND NON-PLANOR CIRCUITS
32.	SOLVE COMPLEX NETWORK	
		A. REVIEW ALL NETOWRK THEORMS
		B. CONSIDERATIONS GIVEN TO COMPLEX NETWORWS
		C. SOLVE COMPLEX NETWORKS

ELECTRICITY/ELECTRONICS TASK LIST
ALTERNATING CURRENT CIRCUITS

TASK	DESCRIPTION	M.P.O.
1.	EXAMINE MAGNETISM	
		A. EXAMINE THE MAGNETIC FIELD
		B. EXPLORE MAGNETIC FLUX
		C. EXAMINE FLUX DENSITY
		D. EXAMINE INDUCTION BY THE MAGNETIC FIELD
		E. EXAMINE AIR GAP AND TYPES OF MAGNETS
		F. EXPLORE MAGNETIC SHIELDING
		G. EXAMINE THE HALL EFFECT
2.	EXAMINE MAGNETIC UNITS	
		A. EXPLORE THE AMPERE-TURN
		B. EXPLORE FIELD INTENSITY
		C. EXAMINE PERMEABILITY
		D. EXAMINE THE B-H MAGNETIZATION CURVE
		E. EXPLORE MAGNETIC HYSTERESIS
		F. EXPLORE OHM'S LAW FOR MAGNETIC CIRCUITS
		G. EXAMINE RELATIONS BETWEEN MAGNETIC UNITS
		H. EXPLORE THE COMPARISON OF ELECTRIC FIELDS
3.	EXAMINE ELECTROMAGNETIC INDUCTION	
		A. EXAMINE THE MAGNETIC FIELD AROUND AN ELECTRICAL CURRENT
		B. EXPLORE MAGNETIC POLARITY OF A COIL
		C. EXAMINE MOTOR ACTION BETWEEN TWO MAGNETIC FIELDS
		D. EXPLORE INDUCED CURRENT
		E. EXAMINE LENZ'S LAW
		F. EXAMINE GENERATING AN INDUCED VOLTAGE
		G. EXAMINE FARADAY'S LAW
4.	EXAMINE ALTERNATING VOLTAGE AND CURRENT	
		A. EXPLORE ALTERNATING VOLTAGE
		B. EXPLORE THE SINE WAVE
		C. EXPLORE THE VOLTAGE AND CURRENT VALUES FOR A SINE WAVE
		D. PERFORM EXPERIMENT ON ALTERNATING VOLTAGE

ELECTRICITY/ELECTRONICS TASK LIST
ALTERNATING CURRENT CIRCUITS (CONTINUED)

TASK	DESCRIPTION	M.P.O.
5.	EXAMINE AC SINE WAVE	
		A. EXPLORE FREQUENCY
		B. EXPLORE THE PERIOD
		C. EXPLORE THE WAVE LENGTH
		D. EXPLORE THE PHASE ANGLE
		E. EXPLORE THE TIME FACTORS IN FREQUENCY AND PHASE
6.	EXAMINE THE OPERATION OF THE "O" SCOPE	
		A. EXAMINE TIME PER DIVISION
		B. EXAMINE VOLTS PER DIVISION
		C. PERFORM EXPERIMENT ON SINE WAVE MEASUREMENTS
7.	EXAMINE AC WAVEFORMS	
		A. EXPLORE AC CIRCUITS WITH RESISTANCE
		B. EXPLORE NONSINUSOIDAL AC WAVE FORMS
		C. EXPLORE HARMONIC FREQUENCY
8.	EXPLORE INDUCTANCE	
		A. EXPLORE INDUCTANCE BY ALTERNATING CURRENT
		B. EXPLORE SELF INDUCTANCE
		C. EXPLORE SELF INDUCED VOLTAGE
		D. EXPLORE HOW INDUCED VOLTAGE OPPOSES A CHANGE IN CURRENT
9.	EXPLORE TRANSFORMERS	
		A. EXAMINE MUTUAL INDUCTANCE
		B. EXPLORE TRANSFORMERS
		C. EXAMINE IR LOSSES
		D. EXAMINE CORE LOSES
		E. EXAMINE TYPES OF CORES
		F. EXAMINE VARIABLE INDUCTANCE
		G. PERFORM EXPERIMENT
10.	EXAMINE INDUCTANCE IN SERIES AND PARALLEL	
		A. EXAMINE INDUCTANCE IN SERIES AND PARALLEL
		B. EXAMINE STRAY INDUCTANCE
		C. EXAMINE ENERGY IN MAGNETIC FIELD OF INDUCTANCE
		D. EXAMINE TROUBLES IN COILS
11.	EXPLORE INDUCTIVE REACTANCE	
		A. EXPLORE HOW X_L REDUCES THE AMOUNT OF CURRENT
		B. EXPLORE 2 PIE FL
		C. EXPLORE SERIES AND PARALLEL X_L
		D. APPLY OHM'S LAW TO X_L

ELECTRICITY/ELECTRONICS TASK LIST
ALTERNATING CURRENT CIRCUITS (CONTINUED)

TASK	DESCRIPTION	M.P.O.
11.	EXPLORE INDUCTIVE REACTANCE (CONTINUED)	
		E. PERFORM EXPERIMENT
12.	APPLY X_L FOR DIFFERENCT FREQUENCIES	
		A. APPLY X_L FOR DIFFERENT FREQUENCIES
		B. EXPLORE SINE WAVE INDUCTIVE SHAPES
		C. PERFORM EXPERIMENT
13.	EXPLORE CAPACITORS	
		A. EXPLORE CHARGING AND DISCHARGING
		B. EXPLORE THE FARAD UNIT OF MEASURE
		C. EXPLORE CAPACITOR COLOR CODING AND TYPES OF CAPACITORS
		D. PERFORM EXPERIMENT
14.	EXAMINE SERIES/PARALLEL CAPACITORS	
		A. EXPLORE PARALLEL CAPACITORS
		B. EXPLORE SERIES CAPACITORS
		C. EXAMINE STRAY CAPACITIVE AND INDUCTIVE EFFECTS
		D. EXAMINE ENERGY STORED IN THE ELECTROSTACTIC FIELD
		E. EXPLORE CAPACITOR TROUBLES
		F. PERFORM EXPERIMENT
15.	EXPLORE CAPACITIVE REACTANCE	
		A. EXPLORE ALTERNATING CURRENT IN A CAPACITIVE CIRCUIT
		B. EXAMINE CAPACITIVE REACTANCE
		C. EXPLORE SERIES/PARALLEL CAPACITIVE REACTANCE
		D. EXAMINE OHM'S LAW APPLIED TO CAPACITIVE REACTANCE
16.	APPLICATION OF CAPACITIVE REACTANCE	
		A. APPLICATIONS OF CAPACITIVE REACTANCE
		B. EXPLORE SINE WAVE CHARGE AND DISCHARGE CURRENTS
		C. PERFORM EXPERIMENTS ON CHARGE AND DISCHARGE CURRENTS

ELECTRICITY/ELECTRONICS TASK LIST
ALTERNATING CURRENT CIRCUITS (CONTINUED)

TASK	DESCRIPTION	M.P.O.
17.	EXPLORE RC AND RL TIME CONSTANTS	
		A. EXPLORE RESPONSE OF RESISTANCE ALONE
		B. EXAMINE RL TIME CONSTANTS
		C. EXAMINE HIGH VOLTAGE PRODUCED BY OPENING RL CIRCUITS
		D. EXAMINE RC TIME CONSTANTS
		E. EXPLORE RC CHARGE AND DISCHARGE CURVES
		F. EXAMINE HIGH CURRENT PRODUCED BY SHORTING A RC CIRCUIT
		G. PERFORM EXPERIMENT ON SERIES RL CIRCUIT
		H. PERFORM EXPERIMENT ON SERIES RC CIRCUIT
18.	EXPLORE LONG AND SHORT TIME CONSTANTS	
		A. EXPLORE RC WAVE SHAPES
		B. EXPLORE LONG AND SHORT TIME CONSTANTS
		C. EXPLORE EFFECTS OF SHORT RC TIME CONSTANTS ON CHARGE AND DISCHARGE
		D. EXPLORE THE EFFECTS OF LONG TIME CONSTANTS FOR RC COUPLING
		E. EXAMINE UNIVERSAL TIME CONSTANTS
		F. EXPLORE REACTANCE AND TIME CONSTANTS COMPARISON
		G. PERFORM EXPERIMENT ON RC TIME CONSTANTS
19.	EXPLORE INDUCTIVE REACTANCE AND RESISTANCE IN AC CIRCUITS	
		A. EXAMINE SINE-WAVE INDUCTIVE CURRENT
		B. EXAMINE INDUCTIVE REACTANCE AND RESISTANCE IN SERIES CIRCUITS
		C. EXAMINE IMPEDANCE
		D. EXAMINE INDUCTANCE AND RESISTANCE IN PARALLEL CIRCUITS
		E. EXPLORE "Q" OF A COIL
		F. EXAMINE AF AND RF CHOKES
		G. EXAMINE GENERAL CASE OF INDUCTIVE VOLTAGE
		H. EXPLORE CALCULATING THE RL TIME CONSTANT
		I. PERFORM EXPERIMENT ON REACTANCE OF A SERIES RL CIRCUIT
		J. PERFORM EXPERIMENT ON REACTANCE OF A PARALLEL RL CIRCUIT

ELECTRICITY/ELECTRONICS TASK LIST
ALTERNATING CURRENT CIRCUITS (CONTINUED)

TASK	DESCRIPTION	M.P.O.
20.	EXPLORE CAPACITIVE REACTANCE AND RESISTANCE IN AC CIRCUITS	
	A. EXAMINE SINE WAVE CAPACITIVE CURRENT	
	B. EXAMINE CAPACITIVE REACTANCE AND RESISTANCE IN SERIES CIRCUITS	
	C. EXAMINE CAPACITIVE REACTANCE AND RESISTANCE IN PARALLEL CIRCUITS	
	D. EXPLORE RF AND AF COUPLING CAPACITORS	
	E. EXAMINE CAPACITIVE VOLTAGE DIVIDERS	
	F. EXPLORE GENERAL CASE OF CAPACITIVE CURRENT	
	G. EXPLORE CALCULATING THE RC TIME CONSTANT	
	H. PERFORM EXPERIMENT ON REACTANCE OF A SERIES RC CIRCUIT	
	I. PERFORM EXPERIMENT ON REACTANCE OF A PARALLEL RC CIRCUIT	
21.	EXPLORE THE "J" OPERATOR	
	A. EXPLORE POSITIVE AND NEGATIVE NUMBERS	
	B. EXPLORE THE "J" OPERATOR	
	C. EXAMINE THE DEFINATION OF A COMPLEX NUMBERS	
	D. EXPLORE HOW COMPLEX NUMBERS ARE APPLIED TO AC CIRCUITS	
	E. EXPLORE IMPEDANCE IN COMPLEX FORM	
	F. EXAMINE OPERATIONS WITH COMPLEX NUMBERS	
	G. EXAMINE MAGNITUDE AND ANGLE OF COMPLEX NUMBERS	
	H. EXAMINE POLAR FORM OF COMPLEX NUMBERS	
22.	EXAMINE COMPLEX NUMBERS IN AC CIRCUITS	
	A. EXPLORE CONVERTING POLAR TO RECTANGULAR FORM	
	B. EXPLORE COMPLEX NUMBERS IN SERIES AC CIRCUITS	
	C. EXPLORE COMPLEX NUMBERS IN PARALLEL AC CIRCUITS	
	D. EXAMINE COMBINING TWO COMPLEX BRANCH IMPEDANCE	
	E. EXAMINE COMBINING COMPLEX BRANCH CURRENTS	
	F. EXAMINE PARALLEL CIRCUITS WITH THREE COMPLEX BRANCHES	

ELECTRICITY/ELECTRONICS TASK LIST
ALTERNATING CURRENT CIRCUITS (CONTINUED)

TASK	DESCRIPTION	M.P.O.
23.	EXAMINE REACTANCE AND RESISTANCE IN AC CIRCUITS	
		A. EXAMINE AC CIRCUITS WITH RESISTANCE ONLY
		B. EXAMINE AC CIRCUITS WITH X_L ONLY
		C. EXAMINE AC CIRCUITS WITH X_C ONLY
		D. EXAMINE OPPOSITE REACTANCE
		E. EXAMINE SERIES REACTANCE AND RESISTANCE
		F. EXAMINE PARALLEL REACTANCE AND RESISTANCE
		G. EXAMINE SERIES-PARALLEL REACTANCE AND RESISTANCE
		H. PERFORM EXPERIMENT ON REACTANCE IN A SERIES LRC CIRCUIT
		I. PERFORM EXPERIMENT ON REACTANCE IN A PARALLEL LRC CIRCUIT
24.	EXPLORE APPARENT AND REAL POWER	
		A. EXAMINE REAL POWER
		B. EXAMINE APPARENT POWER
		C. EXPLORE POWER FACTOR
		D. EXAMINE POWER FACTOR CORRECTION
		E. PERFORM EXPERIMENT ON POWER FACTOR CORRECTION
25.	EXPLORE SERIES RESONANCE	
		A. EXAMINE THE RESONANCE EFFECT
		B. EXAMINE SERIES RESONANCE
		C. EXAMINE THE RESONANCE FREQUENCY
		D. EXAMINE THE "Q" MAGNIFICATION FACTOR
		E. EXPLORE THE BAND WIDTH OF A RESONANCT CIRCUIT
		F. PERFORM EXPERIMENT ON SERIES RESONANCE CIRCUITS
26.	EXPLORE PARALLEL RESONANCE	
		A. EXAMINE PARALLEL RESONANCE
		B. EXPLORE TUNING
		C. EXPLORE MISTUNING
		D. EXPLORE ANALYSIS OF PARALLEL RESONANT CIRCUITS
		E. EXPLORE DAMPING OF PARALLEL RESONANT CIRCUITS
		F. EXAMINE CHOOSING L AND C FOR A RESONANT CIRCUIT
		G. PERFORM EXPERIMENT ON PARALLEL RESONANCE CIRCUITS

TASK	DESCRIPTION	M.P.O.
27.	EXAMINE COUPLING AND BYPASS FILTERS	
		A. EXPLORE EXAMPLES OF FILTERING
		B. EXAMINE DIRECT CURRENT COMBINED WITH ALTERNATING CURRENT
		C. PERFORM EXPERIMENT ON DC COMBINED WITH AC
		D. EXAMINE TRANSFORMER COUPLING
		E. EXAMINE CAPACITOR COUPLING
		F. EXAMINE BYPASS CAPACITORS
		G. EXAMINE FILTER CIRCUITS
		H. PERFORM EXPERIMENT ON BYPASS FILTERS
28.	EXAMINE BASIC LOW/HIGH PASS FILTERS	
		A. EXAMINE LOW PASS FILTERS
		B. PERFORM EXPERIMENT ON LOW PASS FILTERS
		C. EXAMINE HIGH PASS FILTERS
		D. PERFORM EXPERIMENT ON HIGH PASS FILTERS
		E. EXPLORE RESONANT FILTERS
		F. EXAMINE INTERFERANCE FILTERS

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FROM THIS POINT THE LISTING CONTAINS ONLY PROGRAM CONTENT AND MASTERY TOPICS IN THE BASIC ELECTRONICS CORE WHICH HAVE BEEN IDENTIFIED. COMPETENCY BASED LEARNING TASKS HAVE NOT BEEN FULLY DEVELOPED AT THIS TIME.

LINEAR SEMICONDUCTOR CIRCUITS
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INTRODUCTION
1. MODELS (IDEALIZATION)
2. R, L AND O APPROXIMATIONS
3. CHASSIS AND GROUND

SEMICONDUCTOR THEORY
1. CRYSTALS
2. CONDUCTION IN CRYSTALS
3. HOLE/ELECTRON CURRENT
4. DOPING

PN JUNCTIONS
1. THE UNBIASED DIODE
2. THE ENERGY HILL
3. FORWARD BIAS
4. REVERSE BIAS
5. BIPOLAR AND UNIPOLAR DEVICES

DIODES
1. RECTIFIERS
2. THE FORWARD DIODE CURVE
3. THE IDEAL DIODE
4. SECOND APPROXIMATION
5. THE THIRD APPROXIMATION
6. REVERSE RESISTANCE
7. DIODE CAPACITANCE
8. CHARGE STORAGE
9. OTHER TYPES OF DIODES
10. ZENER DIODES

DIOED CIRCUITS
1. HALF WAVE RECTIFIER
2. THE CENTER-TAP RECTIFIER
3. BRIDGE RECTIFIERS
4. CHOKE INPUT FILTERS
5. CAPACITOR-INPUT FILTER
6. NON-IDEAL PEAK RECTIFIER
7. RC AND RL FILTERS
8. VOLTAGE MULTIPLIERS
9. VOLTAGE REGULATION
10. ZENER REGULATORS
11. CLIPPERS
12. CLAMPERS
13. PEAK-TO-PEAK DETECTOR
14. DC RETURN

MIPOLAR TRANSISTORS
1. THE THREE DOPED REGIONS
2. UNBIASED TRANSISTORS
3. FF AND RR BIAS
4. FORWARD REVERSE BIAS

5. THE CE CONNECTION
6. TRANSISTOR CURVES

TRANSISTOR BIASING CIRCUITS
1. BASE BIAS
2. VOLTAGE-DIVIDER BIAS
3. COLLECTOR FEEDBACK BIAS
4. EMITTER BIAS
5. PNP BIASING CIRCUITS
6. MOVING GROUND AROUND
7. UPSIDE-DOWN CONVENTION FOR PNP TRANSISTORS
8. COLLECTOR CUTTOFF

AC EQUIVALENT CIRCUITS
1. COUPLING AND BYPASS CAPACITORS
2. SUPERPOSITION THEOREM
3. TRANSISTOR EQUIVALENT CIRCUITS
4. THE IDEAL TRANSISTOR
5. EMITTER-BASE RESISTANCE
6. AC BETA
7. THE IDEAL MODEL

SMALL-SIGNAL AMPLIFIERS
1. BASE DRIVE AND EMITTER DRIVE
2. BASE DRIVEN FORMULAS
3. THE COMMON-EMITTER AMPLIFIER
4. SWAMPING THE EMITTER DIODE
5. INPUT IMPEDANCE
6. SOURCE IMPEDANCE
7. EMITTER FOLLOWER
8. DARLINGTON PAIRS
9. TYPES OF COUPLING
10. DIRECT COUPLING
11. COMMON-BASE AMPLIFIER

CLASS A POWER AMPLIFIERS
1. THE Q-POINT
2. DC LOAD LINE
3. AC LOAD LINE
4. OPTIMUM Q-POINT FOR CLASS A
5. CLASS A POWER FORMULAS
6. LARGE-SIGNAL GAIN AND IMPEDANCE
7. TRANSISTOR POWER RATING

CLASS B PUSH-PULL AMPLIFIERS
1. THE BASIC IDEA OF PUSH-PULL
2. DISTORTION
3. CURRENT MIRROR
4. SETTING THE Q-POINT
5. CLASS B EMITTER FOLLOWER
6. POWER RELATIONS
7. DARLINGTON AND COMPLIMENTARY PAIRS
8. OTHER CLASS B AMPLIFIER CIRCUITS
9. A COMPLETE AMPLIFIER

CLASS C POWER AMPLIFIERS

1. BASIC CLASS C ACTION
2. OTHER CLASS C RELATIONS
3. TUNED CLASS C AMPS
4. POWER RELATIONS
5. FREQUENCY MULTIPLIERS

OPERATIONAL AMPLIFIERS

1. IDEAL OP AMP CHARISTERISTICS
2. SLEW RATE
3. OFF SETS
4. INPUT/OUTPUT IMPEDANCES
5. SUMMING OP AMP CIRCUIT
6. AVERAGING OP AMP CIRCUIT
7. NON-INVERTING OP AMP CIRCUIT
8. VOLTAGE FOLLOWER OP AMP CIRCUIT
9. DIFFERENTIAL AMP
10. INSTRUMENTATION AMPS
11. INTEGRATING AMPS
12. DIFFERENTING AMPS
13. LOGARITHMIC AMPS
14. COMPARATOR
15. L.P. FILTERS
16. H.P. FILTERS
17. BANDPASS FILTERS
18. BAND REJECT FILTERS
19. GYRATOR
20. OSCILLATORS
21. SCHMITT TRIGGERS
22. SQUARE WAVE GENERATORS

FETS

1. JFETS
2. JFET DRAIN CURVES
3. JFET PARAMETERS
4. DEPLETION-ENHANCEMENT MOSFETS
5. ENHANCEMENT MOSFETS

FET CIRCUIT ANALYSIS

1. SELF BIAS
2. SELF BIAS GRAPHS
3. CURRENT SOURCE BIAS
4. BIASING MOSFETS
5. COMMON-SOURCE AMPLIFIER
6. COMMON-DRAIN AMPLIFIER
7. COMMON-GATE AMPLIFIER
9. FET APPLICATIONS

LOGIC CIRCUITS

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LOGIC CIRCUITS

1. LOGIC USING SWITCHES
2. LOGIC USING RELAYS
3. LOGIC CIRCUITS USING DIODES

4. DIODE-TRANSISTOR LOGIC (DTL)
5. TRANSISTOR-TRANSISTOR LOGIC (TTL)
6. EMITTER-COUPLED LOGIC (ECL)
7. INTEGRATED INJECTION LOGIC (I SQUARED L)
8. MOS LOGIC
9. COMPLIMENTARY MOS LOGIC (CMOS)

NUMBER SYSTEMS
1. DECIMAL NUMBERS
2. BINARY NUMBERS
3. OCTAL AND HEXADECIMAL NUMBERS
4. CONVERSION BETWEEN NUMBER BASES
5. NEGATIVE NUMBERS

CODING
1. NEED FOR CODING
2. BINARY-CODED-DECIMAL NUMBERS (BCD)
3. UNIT DISTANCE CODES
4. ERROR-DETECTING CODES
5. ALPHANUMERIC CODES

BOOLEAN ALGEBRA AND SIMPLIFICATION METHODS
1. BOOLEAN ALGEBRA
2. TRUTH TABLES
3. LOGIC OPERATORS
4. POSTULATES OF BOOLEAN ALGEBRA
5. THEOREMS OF BOOLEAN ALGEBRA
6. ANALYSIS AND SYNTHESIS OF COMBINATIONAL LOGIC CIRCUITS
7. STANDARD FORMS
8. KARNAUGH MAPS

COMBINATIONAL LOGIC CIRCUITS
1. ADDITIONAL LOGIC OPERATORS
2. POSITIVE AND NEGATIVE LOGIC
3. 2-STAGE AND LOGIC CIRCUITS
4. 2-STAGE NOR LOGIC CIRCUITS
5. AND-OR-INVERT GATES (AOI)
6. DIGITAL MULTIPLEXERS
7. DECODERS
8. PRIORITY ENCODERS

FLIP-FLOPS
1. INTRODUCTION
2. R-S STORAGE FF'S
3. CLOCKED R-S FF'S
4. STATE TABLES AND FUNCTION TABLES OF CLOCKED FF'S
5. CLOCKED D FF'S
6. USE OF CLOCKED FF'S FOR STORAGE
7. MASTER-SLAVE R-S AND D FF'S
8. MASTER-SLAVE FF'S WITH DATA LOCKOUT
9. EDGE TRIGGERED FF'S
10. J-K FF'S
11. T FF'S
12. DIRECT PRESET AND CLEAR INPUTS
13. TIMING

COUNTERS

1. INTRODUCTION
2. DIVIDE BY 2 COUNTERS
3. RIPPLE COUNTERS
4. ONE-BIT COUNTERS
5. STATE DIAGRAMS
6. SYNCHRONOUS COUNTERS
7. HYBRED COUNTERS

SHIFT REGISTERS AND SHIFT REGISTER COUNTERS

1. INTRODUCTION
2. SHIFT REGISTERS
3. SHIFT REGISTER COUNTERS
4. OPERATING SPEED

LARGE-SCALE I.C.'S

1. DYNAMIC MOS INVERTERS AND GATES
2. MOS SHIFT REGISTERS
3. RANDOM-ACCESS MEMORIES (RAM)
4. READ-ONLY MEMORIES (ROM)
5. PROGRAMMABLE LOGIC ARRAYS (PAL)
6. CONTENT-ADDRESSABLE MEMORIES (CAM)
7. FIRST-IN FIRST-OUT MEMORIES (FIFO)
8. CHARGE COUPLED DEVICES (CCD)
9. MAGNETIC BUBLE MEMORIES (MBM)

ARITHMETIC CIRCUITS

1. DIGITAL COMPARITORS
2. ADDERS
3. SUBTRACTORS
4. ARITHMETIC LOGIC UNITS (ALU)
5. MULTIPLIERS

CODE CONVERTERS AND DISPLAY DEVICES

1. EXCESS-3 GRAY-CODE TO 8-4-2-1 BCD CONVERTER
2. BINARY TO GRAY CONVERTER
3. GRAY TO BINARY CONVERTER
4. BINARY TO BCD CONVERTERS
5. BCD TO BINARY CONVERTERS
6. DISPALY DECODERS AND DRIVERS

COMPUTERS AND MICROCOMPUTERS

1. BASIC CONSIDERATIONS
2. BASIC STRUCTURE
3. BASIC PROGRAMMING TECHNIQUES
4. INPUT-OUTPUT (I/O)
5. MAIN MEMORY
6. CONTROL UNITS

D/A AND A/D CONVERSION

1. DIGITAL-TO-ANALGO CONVERSIONS
2. OPERATIONAL AMPLIFIERS
3. CURRENT SWITCHES FOR DAC'S
4. DIGITAL-TO-ANALOG CONVERTERS USING LADDER NETWORKS
5. DAC'S USING QUAD CURRENT SOURCES

6. MULTIPLYING DAC
7. MEASURING DAC PARAMETERS
8. ANALOG-TO-DIGITAL CONVERTERS
9. CIRCUIT COMPONENTS FOR ADC'S
10. COUNTER RAMP ADC
11. TRACKING ADC
12. SUCESSIVE APPROXIMATION ADC
13. PARALLEL ADC

SYSTEM OPERATION

1. TOLLERANCES, NOISE MARGINS, LOADING RULES
2. POWER DISTRIBUTION
3. GOUNDING
4. SCHMIT TRIGGER CIRCUITS
5. MONOSTABLE MULTIVIBRATORS
6. TROUBLESHOOTING INSTRUMENTS

CONTROL DEVICES

1. MANUALLY OPERATED SWITCHES
2. MECHANICALLY OPERTED SWITCHES
3. RELAYS
4. SEMICONDUCTOR SWITCHES
   - A. THYRISTORS
   - B. SCR'S
   - C. TRIAC
   - D. GATE CONTROLLED SWITCH
   - E. SILLICON-CONTROLLED SWITCH
5. THYRESISTOR TRIGGERING
   - A. SHOCKLEY DIODE
   - B. DIAC
   - C. UNIJUNCTION TRANSISTORS
   - D. PROGRAMMABLE UNIJUCTION TRANSISTORS
   - E. SOLID-STATE RELAYS

TRANSDUCERS

1. TEMPERATURE SENSING
2. HUMIDITY SENSING
3. DISPLACEMENT, STRESS AND STRAIN
4. MAGNETISM
5. PRESSURE
6. FLUID FLOW
7. LIQUID LEVEL
8. MEASUREMENT WITH BRIDGES

PULSE MODULATION

1. ANALOG TYPE
   - A. PULSE AMPLITUDE (PAM)
   - B. PULSE-WIDTH (PWN)
   - C. PULSE POSITION
   - D. PULSE FREQUENCY (PFM)
2. DIGITAL
   - A. PULSE CODE MODULATION (PCM)
   - B. OTHER DIGITAL SYSTEMS

TELEMETRY

1. MULTIPLEXING
2. FREQUENCY DIVISION
3. TIME DIVISION

JO DAVIESS-CARROLL AREA VOCATIONAL CENTER
HIGHLAND COMMUNITY COLLEGE
STEPHENSON AREA CAREER CENTER

EDUCATION FOR TECHNOLOGY PROJECT

HYDRAULICS AND PNEUMATICS

Appendix E

The task lists here presented in hydraulics and pneumatics are intended to develop basic skills and knowledges which provide a foundation on which more advanced (post secondary) training in automated production/ robotics can be built.

These task lists should be supplemented with task lists from the areas of electronics, computer literacy, machine trades/numerical control and drafting.

Students working from these task lists should enter the 11th grade with a firm background in mechanics, basic electronics/electricity, and the basic machine trades skills such as drilling, cutting, filing, and grinding. These areas should be supplemented with familiarization in reading technical manuals, flow charts, and blueprints. Math skills should include algebra, measurements, and problem solving. Science skills should concentrate on principles of physics, especially fluid dynamics, mechanical laws, and compression.

Equipped with a comprehensive background in electronics, electrical/ mechanical principles, fluid and pneumatic power systems, numerical control and computer applications, students will continue their training at the community college.

At the community college level students will train in robotics systems analysis, systems applications, design and trouble shooting.

A task list continuum from the ninth grade should be developed which allows open entry/exit at any level at which the student identifies and interest, or a need for training. This task list will be used by instructors as a experience/mastery record as the student progresses through the program from feeder school, through AVC, to the Community College. Ideally future education/industry articulation will allow the task list to be expanded and incorporated into industry training and certification programs.

HYDRAULICS & PNEUMATICS

TASK NUMBER	TASK DESCRIPTION
100-001	IDENTIFY HYD. SYSTEMS & CAPABILITIES
100-002	IDENTIFY HYD. PRINCIPLES
100-003	IDENTIFY HYD. COMPONENTS
100-004	IDENTIFY FLUID POWER ANSI SYMBOLS
100-005	IDENTIFY TOOLS & TEST EQUIP USED IN HYD.
100-006	IDENTIFY HYD. HOSES, LINES & FITTINGS
100-007	IDENTIFY TYPES OF HYDRAULIC FLUIDS
100-008	SERVICE SIMPLE HYD. LINES, HOSES & FITTINGS
100-009	IDENTIFY TYPES & DESCRIBE FUNCTIONS OF HYD. FILTERS & FILTER SYSTEMS
100-010	SERVICE BASIC HYD. FILTERING SYSTEMS
100-011	IDENTIFY TYPES & DESCRIBE FUNTIONS OF HYDRAULIC CONTROL VALVES
100-012	SERVICE BASIC (SPOOL) HYD. CONTROL VALVES
100-013	DEVELOP HYD. CIRCUITS FROM HYD. SCHEMATICS
100-014	IDENTIFY TYPES & DESCRIBE FUNCTIONS OF HYD. PUMPS
100-015	SERVICE BASIC HYD. PUMPS
100-016	IDENTIFY & DESCRIBE FUNTION OF HYDRAULIC ACCUMULATOR
100-017	IDENTIFY & DESCRIBE FUNCTIONS OF HYD. SERVO SYSTEM
100-018	SERVICE BASIC HYD. SERVO SYSTEM
100-019	IDENTIFY & DESCRIBE FUNTIONS OF HYD. CYLINDERS
100-020	SERVICE HYDRAULIC CYLINDERS
101-001	DESCRIBE ADVANCED PRESSURE & FLOW PRINCIPLES

HYDRAULICS & PNEUMATICS: cont.

TASK NUMBER	TASK DESCRIPTION
101-002	DESIGN & BUILD HYD. SYSTEM FOR ROBOTICS APPLICATIONS
101-003	DESCRIBE & IDENTIFY SOPHISTICATED SERVO SYSTEM CHARACTERISTICS
101-004	IDENTIFY & DESCRIBE SOPHISTICATED HYD. CONTROL SYSTEMS
101-005	IDENTIFY & DESCRIBE SOPHISTICATED HYD. PUMPING SYSTEMS
101-006	IDENTIFY & DESCRIBE SOPHISTICATED HYD. CIRCUITRY
101-007	IDENTIFY THERMO DYNAMICS OF HYD. SYSTEM
101-008	TEST HYD. SYSTEM
101-009	SERVICE HYD. CIRCUITRY
101-010	SERVICE HYD. PUMPS
101-011	SERVICE HYD. CONTROLS
101-012	SERVICE HYD. SERVO SYSTEMS
101-013	IDENTIFY & DESCRIBE FUNCTIONS OF HYDRAULIC RESERVIORS
101-014	SERVICE HYD. RESERVIORS
101-015	SERVICE HYD. FILTERING SYSTEMS
101-016	SERVICE HYD. CYLINDERS
101-017	SERVICE HYD. ACCUMULATOR
200-001	IDENTIFY PNEUMATIC SYSTEMS & THEIR CAPABILITIES
200-002	IDENTIFY PNEUMATIC PRINCIPLES
200-003	IDENTIFY PNEUMATIC SYSTEM COMPONENTS & THEIR FUNCTIONS
200-004	IDENTIFY TOOLS, TEST EQUIPMENT & STANDARDS COMMON TO PNEUMATIC POWER

HYDRAULICS & PNEUMATICS: cont.

TASK NUMBER	TASK DESCRIPTION
200-005	IDENTIFY LINES, & FITTINGS USED IN PNEUMATIC POWER
200-006	MEASURE CUT & FABRICATE PNEUMATIC LINES
200-007	TEST PNEUMATIC LINES
200-008	IDENTIFY PNEUMATIC COMPRESSOR TYPES
200-009	DESCRIBE APPLICATIONS FOR DIFFERENT TYPES OF COMPRESSORS
200-010	DESCRIBE AIR COMPRESSOR OPERATIONS-HOW IT WORKS
200-011	SERVICE BASIC AIR COMPRESSOR
200-012	IDENTIFY TYPES & APPLICATIONS OF AIR RESERVIORS
200-013	TEST & SERVICE RESERVIORS SYSTEMS
200-014	IDENTIFY PNEUMATIC CONTROL SYSTEMS
200-015	DESCRIBE OPERATION OF AIR VALVES
200-016	TEST & SERVICE BASIC AIR VALVES
200-017	IDENTIFY PNEUMATIC CYLINDERS
200-018	TEST & SERVICE PNEUMATIC CYLINDERS
200-019	IDENTIFY MOISTURE & AIR QUALITY CONTROL SYSTEMS USED IN PNEUMATICS & THEIR APPLICATIONS
200-020	SERVICE MOISTURE & AIR QUALITY CONTROL SYSTEMS
200-021	TROUBLE SHOOT BASIC PNEJMATIC SYSTEMS
201-001	IDENTIFY & SERVICE SOPHISTICATED PNEUMATIC COMPRESSORS
201-002	IDENTIFY & SERVICE SOPHISTICATED PNEUMATIC VALVES
201-003	IDENTIFY & SERVICE SOPHISTICATED PNEUMATIC CYLINDERS

HYDRAULICS & PNEUMATICS: cont.

TASK NUMBER	TASK DESCRIPTION
201-004	SERVICE ELECTRIC OVER PNEUMATIC COMPONENTS
201-005	DESIGN PNEUMATIC CIRCUITS
201-006	PRESCRIBE PNEUMATIC COMPONENTS FOR CIRCUITS
201-007	TROUBLE SHOOT SOPHISTICATED PNEUMATIC CIRCUITS
201-008	IDENTIFY USES & FUNCTIONS OF INDUSTRIAL AUTOMATED SYSTEMS

JO DAVIESS - CARROLL AREA VOCATIONAL CENTER
HIGHLAND COMMUNITY COLLEGE
STEPHENSON AREA CAREER CENTER

EDUCATION FOR TECHNOLOGY PROJECT

COMPUTER BASIC CURRICULUM

Appendix F

COMPUTERS - COMPUTER APPLICATIONS

The continuum begins with a key boarding class and a computer literacy course between grades 8 and 10. This instruction teaches the student touch location of the keyboard, the vocabulary of BASIC language, and arithmetic and relational operations.

At the secondary level, students are taught how to develop algorithims that can be implemented on a computer to process data. The BASIC language and microprocessors will be used to implement the logic. Students will learn to do problem solving by creating, debugging, and editing programs. Students will also be taught how to create, modify, and manipulate data in a sequential file structure.

The community college will allow a student to complete BASIC programming but will focus on delivery of instruction of higher level languages, machine language, and computer architecture.

A parallel effort at all levels will be conducted which teaches the use of "off the shelf" software. This curriculum includes word processing, data base management, electronic spread sheets, business graphics, and interactive accounting programs.

Related skills at the secondary level would require mathematics skills at approximately the eighth grade level, problem solving ability (working "story problems"), and being able to read manuals supplies with equipment and software. Some manuals require above average reading ability. Science skills are not a significant requirement for the secondary programs, but some knowledge of electricity/electronics and digital theory is needed to understand microprocessor chip architecture taught at the community college.

BASIC I -- PROGRAMMING TASK LIST

- USE OF A COMPUTER SYSTEM & SYSTEM COMMANDS
  - CONNECT EQUIPMENT & LOG ON & LOG OFF
  - LOAD PROGRAMS FROM DISK
  - SAVE PROGRAMS ON DISK
  - LIST PROGRAM ON PRINTER
  - PRINT OUTPUT TO PRINTER
  - DELETE PROGRAM FROM DISK
  - REPLACE PROGRAM ON DISK WITH EDITED VERSION
  - LIST DISK DIRECTORY ON PAPER
  - HANDLE DISK ERRORS
  - HANDLE PRINTER AND/OR PAPER PROBLEMS
- KNOW PRINT, GO TO & END STATEMENT SYNTAX
- WRITE SIMPLE BASIC PROGRAMS TO DISPLAY DESIGNS ON CRT
- KNOW READ-DATA STATEMENT SYNTAX
- KNOW IF-THEN STATEMENT SYNTAX
- FLOWCHART A DOWHILE MAIN PROCESSING LOOP
- RECOGNIZES INITIALIZATION, MAIN LOOP, AND TERMINATION PARTS OF LOGIC
- WRITE SIMPLE I/D PROGRAMS WITH DOWHILE LOOP AS THE MAIN PROCESSING LOOP
- WRITE PROGRAM TO DISPLAY ON SCREEN AND PRINT TO PAPER
- KNOW SYNTAX FOR LET STATEMENT
- KNOW RULES FOR VARIABLE NAMES FOR NUMBERS AND STRINGS
- WRITE PROGRAMS TO PERFORM COMPUTATIONS AND PRINT RESULTS
- FLOWCHART COUNTING LOGIC
- WRITE PROGRAMS TO PERFORMS COUNTS AND PRINT RESULTS
- FLOWCHART LOGIC FOR ACCUMULATING SUMS
- WRITE PROGRAMS TO ACCUMULATE SUMS AND PRINT RESULTS

BASIC I: cont.

- KNOWS HOW TO FORMAT OUTPUT WITH PRINT USING SYNTAX

- KNOWS ELEMENTS OF LOOP STRUCTURE
  INITIALIZE CONTROL VARIABLE
  TEST CONTROL VARIABLE
  MODIFY CONTROL VARIABLE
  PROCESSING STEPS

- KNOWS THE DIFFERENCE BETWEEN DOWHILE AND COUNTIL LOOP

- KNOWS THE IF-THEN-ELSE STRUCTURE

- WRITE FLOWCHART & PROGRAM USING LOOPS AND IF-THEN-ELSE STRUCTURES

- WRITE FLOWCHART & PROGRAM WITH NESTED IF-THEN-ELSE STRUCTURES

- KNOWS HOW TO USE AND, OR & NEGATION CONDITIONS IN IF-THEN-ELSE LOGIC

- WRITE AND FLOWCHART A SINGLE LEVEL BREAK PROGRAM

- KNOW THE SYNTAX FOR THE FOR-NEXT STATEMENT

- WRITE FLOWCHART AND PROGRAM WITH FOR-NEXT LOOPS

- KNOWS SYNTAX FOR THE INPUT STATEMENT

- WRITE & FLOWCHART AN INTERACTIVE PROGRAM THAT IS USER FRIENDLY

- INCLUDE EDIT ROUTINE FOR USER INPUT OF YES/OR RESPONSE IN A PROGRAM

- KNOWS SYNTAX FOR DEFINING AND USING AN ARRAY

- WRITE AND FLOWCHART PROGRAMS THAT USE ONE DIMENTIONAL ARRAYS

- WRITE AND FLOWCHART PROGRAMS THAT USE TWO DIMENTIONAL ARRAYS

- KNOWS HOW TO MANIPULATE ROWS AND COLUMNS OF TWO DIMENTIONAL ARRAY

- WRITE AND FLOWCHART A SEQUENTIAL SEARCH OF AN ARRAY

BASIC I: cont.

- WRITE AND FLOWCHART A BINARY SEARCH OF AN ARRAY
- WRITE AND FLOWCHART A BUBBLE SORT USING ARRAY STORAGE
- WRITE AND FLOWCHART A BUBBLE SORT WITH AN INDEX USING ARRAY STORAGE
- KNOW THE SYNTAX AND PURPOSE OF SUBROUTINES IN BASIC
- WRITE AND FLOWCHART LOGIC USING SUBROUTINES
- KNOWS THE SYNTAX FOR THE ON-GOTO & ON-GOSUB STATEMENTS
- WRITE AND FLOWCHART MENU-DRIVEN LOGIC PROGRAMS
- USE AND SYNTAX FOR THE STRING HANDLING FUNCTIONS RIGHTS, LEFTS, MIDS, STRS, CHRS, INSTRS, INKEYS, GET AS, LEN, ASC, VAL, GET
- USE AND DEFINITION OF USER DEFINES FUNCTIONS
- USE AND SYNTAX FOR ARITHMETIC LIBRARY FUNCTIONS

BASIC II -- PROGRAMMING TASK LIST

- KNOWS SYNTAX AND RULES FOR OPENING AND CLOSING DISK SEQUENTIAL DATA FILES

- WRITE AND FLOWCHART MENU DRIVEN LOGIC FOR FILE HANDLING MODULES

- KNOWS DATA VALIDATION METHODS FOR EDITING INPUT DATA
  - NUMBERIC FIELD EDITING
  - STRING PADDING FOR CORRECT FIELD LENGTH
  - CHARACTER CHECKS
  - FIELD CONCATENATION TO BUILD SINGLE STRING DATA RECORD

- WRITE AND FLOWCHART DISK ERROR HANDLING SUBROUTINE

- WRITE AND FLOW CHART PROGRAMS MODULES FOR SEQUENTIAL FILE HANDLING
  - TO LOAD A SEQUENTIAL MASTER FILE
  - TO LOAD A SEQUENTIAL TRANSACTION FILE
  - TO READ A DATA FILE, COUNT THE RECORDS, AND PRINT TO THE SCREEN AND PAPER
  - TO SORT RECORDS ON KEY FIELD AND WRITE TO THE FILE
  - TO EXTRACT RECORDS FROM A DATA FILE AND PRINT
  - TO EXTRACT RECORDS FROM A DATA FILE TO BUILD NEW FILE
  - TO VIEW RECORDS ONE AT A TIME
  - TO MERGE RECORDS FROM TWO SEQUENCED FILES
  - TO ADD AND/OR APPEND RECORDS TO A DATA FILE
  - TO DELETE RECORDS FROM A DATA FILE
  - TO UPDATE FIELDS IN RECORDS OF A DATA FILE

- KNOWS SYNTAX AND RULES FOR DIRECT ACCESS DISK FILE HANDLING

- WRITE AND FLOWCHART PROGRAM MODULES FOR DIRECT ACCESS FILE HANDLING
  - REPEAT THE ABOVE TASKS