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ABSTRACT

Part 1 of the trade and industrial education curriculum guide for grades 9-12 contains a brief program overview and Vocational Industrial Clubs of America (VICA) description, more detailed descriptions of in-school and out-of-school programs and program classification methods, a list of references, and charts of various programs and training facility locations. Part 2 presents detailed program descriptions which include course descriptions at beginning and advanced levels (specifying credits, minimum class time, maximum students per class, and prerequisites), program objectives, and student performance objectives for each course for the following trade and industrial education programs: auto body repair, auto mechanics, barbering, bricklaying, carpentry, cosmetology, drafting and design, electricity, heating and air conditioning, industrial cooperative training, machinist trade, maintenance and repair, plumbing practical nursing, printing, television servicing, welding, electricity/electronics trade exploration, and ornamental horticulture. (JR)

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CE 001366

TRADE AND INDUSTRIAL

GRADES 9-12

LETTER OF TRANSMITTAL

Program of Studies defines the instructional program to be implemented in Fairfax County Public Schools. It is to be used by schools in establishing their Commitment to Education as well as a basis for meeting Standards of Quality in Virginia. Schools are encouraged to develop supplemental objectives and program variations in accord with local needs and with the approval of the area superintendent. During the school year 1974-75 the program descriptions and the objectives are subject to intensive review in an attempt to achieve consensus.

The Program of Studies will continue to be developed through the involvement of administrative and instructional personnel, students, parents, and other members of the community. Revision is part of the design of the Program of Studies in order that all persons in the community may participate fully in developing a current, relevant instructional program.

The success of the Program of Studies will depend primarily upon its utilization by teachers and on the continued educational development of our students.

S. John Davis
Division Superintendent

September 3, 1974

INTRODUCTION

The Program of Studies defines the instructional program for Fairfax County Public Schools, kindergarten through grade twelve, and is organized as follows:

Section A - Program Description and General Goals

Section B - Program Objectives

Section C - Suggested Teaching/Learning Strategies

Section D - Prerequisites for Student Placement

Section E - Program Evaluation

Section F - Instructional Material Requirements

Section G - Program Support Requirements

At present the sections are in various stages of developemnt. During the fall of 1974 instructional personnel will receive for use and reaction Sections A and B, and working drafts for Section C. The other sections will be written, reviewed, and completed at later dates as they are dependent upon Sections A and B.

TRADE & INDUSTRIAL

FAIRFAX COUNTY PUBLIC SCHOOLS
Department of Instructional Services
Division of Curriculum Services
September 3, 1974

PROGRAM OF STUDIES

TRADE AND INDUSTRIAL

SECTION A

TABLE OF CONTENTS

TRADE AND INDUSTRIAL EDUCATION
PROGRAM DESCRIPTION

Trade and industrial education is concerned with at least ten of the 15 below-listed occupational clusters developed by the U. S. Office of Education for the "Career Education Program Model."

1. Agri-Business and Natural Resourses
2. Business and Office
3. Communication and Media
4. Construction
5. Enviornmental Control
6. Health
7. Hospitality and Recreation
8. Manufacturing
9. Marketing and Distribution
10. Marine Science
11. Personal Services
12. Public Services
13. Transportation
14. Consumer and Homemaking
15. Arts and Humanities

Trade and industrial education includes any experiences which are necessary to develop the manipulative skills and related information such as job attitudes, safety practices, and trade judgment necessary for employment in a trade and industrial occupation.

Trade and industrial occupations include:

1. Any skilled trade, semiskilled trade, single-skilled trade, or service occupation which directly functions in designing, producing, processing, assembling, maintaining, servicing, or repairing any product or commodity.

2. Health occupations that render services to the health professions such as nursing, medical, and dental practices, all of which are concerned with providing diagnostic, therapeutic, preventive, restorative, and rehabilitative services to people. As used in this program such occupations include (a) practical nursing, (b) health aides, (c) medical and dental assistants, (d) laboratory assistants and technicians and (e) those occupations that require basic understandings and skills required in giving nursing care or other health services to people.

Trade and industrial education programs are classified as in-school programs (for those students spending full time in a secondary or post-secondary school) and out-of-school programs (for those who have left a formal situation and wish to pursue training on a part-time basis).

I. IN-SCHOOL PROGRAMS

PHASE I - INDUSTRIAL CAREER AWARENESS (GRADES K-6)

Students are informed about trade and industrial occupations through a series of units representing the entire world of work. Instruction includes experiences in using tools, materials, and processes in an exploratory setting. Students will become cognizant of their future role in our industrial and technological society. Instruction is directed toward discovering individual interests and talents, and achieving a positive sense of personal worth and purpose. This phase of the trade and industrial program should be included in the elementary curriculum grades K-6.

PHASE II - INDUSTRIAL CAREER ORIENTATION AND BEGINNING EXPLORATION (GRADES 7-8)

Students receive an orientation to the industrial and technological world and its development. Instruction consists of experiences with the kinds and levels of activities performed by persons in a broad range of trade and industrial occupations for which special skills are required. Activities are intended to inform students of prerequisites for careers; to acquaint them with the significant changing and evolving technologies; to instill in them an understanding and appreciation of work; and to assist them individually in making informed and meaningful career selection.

This phase of the trade and industrial program is not operated as separate trade and industrial courses but is included in the curriculum for industrial arts, home economics, and health education courses grades 7-8.

PHASE III - INDUSTRIAL CAREER EXPLORATION AND BEGINNING TRADE PREPARATION (GRADES 9-10)

The trade and industrial program at this level is intended to provide a curriculum leading to a choice of a specific occupational goal. Students explore a selected family or families of trades having related skill characteristics such as "Power Mechanics and Equipment Maintenance and Repair." (See career development pattern for auto mechanics trades in chart on page 12).

The objectives of this phase of the trade and industrial career development program are accomplished through exploratory courses designed around occupational families which derive from one of the career clusters defined earlier, such as "transportation." These classes are provided at the students' home school, generally on a one-hour daily basis and the student receives one unit of credit. Students enroll in these classes at grades 9-10.

Exploratory courses now under development for this phase of the trade and industrial program are:

8702 - Industrial Career Exploration
*8712 - Power Mechanics and Equipment Maintenance Exploration
*8722 - Construction Trades Exploration
*8732 - Personal Service Trades Exploration
*8742 - Graphic Arts and Printing Trades Exploration
*8752 - Electricity/Electronics Trades Exploration
*8762 - Health Service Trades Exploration
*8772 - Metal Working Trades Exploration
**8004 - Agricultural Trades Exploration

An alternative approach for meeting some of the objectives of this phase of the trade and industrial program is the curriculum of industrial arts, home economics, and health education courses at the 9th and 10th grades. (See Program of Studies for these programs).

A special program (Maintenance and Repair) is also provided at this level (grades 9-12) for disadvantaged students. This program is intended to serve students who have experienced difficulties believed to arise from one or more of the following causes: (1) social (those with personality, home, or emotional problems), (2) economic (students from low-income homes), and (3) academic (those who have not developed the ability to master the requirements for progress toward high school graduation).

The curriculum and teaching strategies for these classes are intended to be very flexible, with learning activities geared very closely to the students' individual needs. The student is permitted to progress at his/her own rate in developing attitudes, self-confidence, and occupational skill in accordance with his/her capabilities. Classes are conducted in a facility equipped to provide learning experiences in several of the more common industrial trades. These classes are provided at the student's home school, generally on a two-hour daily basis.

Course No.	Title	Minimum Class Hours	Credits
8542	Maintenance and Repair I	320 hours	2
8543	Maintenance and Repair II	320 hours	2
8544	Maintenance and Repair III	320 hours	2

PHASE IV - INDUSTRIAL CAREER PREPARATION (GRADES 11-12)

Instruction in this phase is directed toward preparation for entry into an industrial occupation.

a. Trade, Service or Health Occupations Preparatory Classes

The types of classes in (1), (2), (3), (4), and (5) which follow are conducted at a school in a school shop or laboratory which is especially designed and equipped and confined to the one trade being taught.

** This program is operated under vocational agriculture.
* These courses should all be identified on official state reports under Course #8702.

In the advanced levels of some classes, students will participate in off-site work activities, such as construction projects as part of the training program.

(1) Skilled Trades, Service or Health Occupations

These classes are for persons who have selected a trade service or health occupation, and who desire training for useful employment in that field. The training given is comprehensive in nature, including instruction in manipulative processes, technical information, and related subjects which are needed by the skilled competent worker. Examples of these classes now being offered are auto mechanics, carpentry, cosmetology, drafting, electricity, printing; practical nursing, and welding.

(2) Semiskilled Occupations

These classes generally are not offered at the advanced level found in those occupations described in (1) above. The performance expected of these workers is semiskilled in nature and the training given, while of high quality, is not as comprehensive in nature. It does include the manipulative processes and related subjects needed by the semiskilled employee. A few of the areas of instruction generally considered to be semiskilled are service station attendants, auto mechanic helpers, maintenance and repair, certain food trades occupations, custodial and health aides.

(3) Single-Skilled Occupations

The worker is expected to perform one or two basic skills, and training in these classes includes experiences in this basic skill as well as any other related knowledge needed. Examples of single-skilled occupations for which classes may be organized are bricklaying, power sewing machine operation, and certain types of welding.

(4) Programs for Disadvantaged Youth

The purpose of this program is to provide for the disadvantaged student a means whereby he/she may learn some occupational skills in accordance with his/her capabilities, and thereby become more attractive for employment upon leaving school.

(5) Programs for the Handicapped

These classes are for students who are physically, mentally, or emotionally handicapped. Each program should be tailor-made to suit the needs of those involved. Content and patterns of operation may vary.

Trade preparatory courses offered in Fairfax County Schools are listed below under eight related occupational families as identified under PHASE III.

Course Number	Course Title	Minimum Class Hours	Credit
	(Power Mechanics and Equipment Maintenance)		
8676	Auto Body Repair I	480	3
8677	Auto Body Repair II	480	3
8506	Auto Mechanics I	480	3
8507	Auto Mechanics II	480	3
8539	Machine Shop I	480	3
8540	Machine Shop II	480	3
(Proposed)	Motorcycle Repair	480	3
	(Construction Trades)		
8503	Heating and Air Conditioning I	480	3
8504	Heating and Air Conditioning II	480	3
8512	Bricklaying I	480	3
8513	Bricklaying II	480	3
8518	Carpentry I	480	3
8519	Carpentry II	480	3
8533	Electricity I	480	3
8534	Electricity II	480	3
8530	Drafting I	480	3
8531	Drafting II	480	3
8551	Plumbing I	480	3
8552	Plumbing II	480	3
8672	Welding I	480	3
8673	Welding II	480	3
8663	Sheet Metal (Proposed)	480	3
8664	Sheet Metal (Proposed)	480	3
	(Personal Services Trades)		
8509	Barbering I	480	3
8510	Barbering II	480	3
8511	Barbering III	480	3
8527	Cosmetology I	500	3
8528	Cosmetology II	500	3
8529	Cosmetology III	500	3
	(Graphic Arts and Printing Trades)		
8530	Drafting I	480	3
8531	Drafting II	480	3
8660	Printing I	480	3
8661	Printing II	480	3

	(Electricity/Electronics Trades)		
8533	Industrial Electricity I	480	3
8534	Industrial Electricity II	480	3
8536	Television Servicing I	480	3
8537	Television Servicing II	480	3
	(Health Service Trades)		
8557	Practical Nursing	480	3
8558	Practical Nursing (clinical, 36 weeks full time)		
	(Metal Working Trades)		
8539	Machine Shop I	480	3
8540	Machine Shop II	480	3
8551	Plumbing I	480	3
8552	Plumbing II	480	3
8672	Welding I	480	3
8673	Welding II	480	3
8663	Sheetmetal I	480	3
8664	Sheetmetal II	480	3
	(Agricultural Trades)		
*8034	Ornamental Horticulture I	480	3
*8035	Ornamental Horticulture II	480	3

State Department of Education policies state that classes in the above-listed courses shall operate for three class periods per day. Other patterns require special permission.

When these classes are not available at the student's home school, he/she is provided transportation to one of the four area Trade and Industrial Centers (Edison, Chantilly, Marshall, or Woodson) where the desired class is available. Schools offering these courses are identified in the chart on page 13.

Students who have completed one of the Level II courses above, but who are still in school, may elect to enroll in the cooperative program (ICT) for their senior year.

b. Cooperative Trade, Service or Health Occupations Preparatory Classes

This program is designed for high school juniors and seniors. The students attend school one-half of each school day and receive work-training experience on the job with a cooperating employer in some trade or industrial occupation the other half of the school day. The program provides a choice of employment objectives from a wide variety of trade and industrial pursuits. Systematic training is given on the job and supplementary instruction related to the training is given in school.

* These programs are operated under vocational agriculture.

Cooperative trade preparatory courses offered in Fairfax County Public Schools are listed below:

Course Number	Course Title	Minimum Class Hours	Credit
8901	Industrial Cooperative Training I	160*	3
8902	Industrial Cooperative Training II	160*	3

*Student must also work 15 hours per week with his/her cooperating employer.

2. OUT-OF-SCHOOL PROGRAMS

These, except for apprentice classes, are operated through the Adult Services Centers at Edison, Marshall, Annandale, and Woodson. They are classified and described as follows:

a. Trade Supplementary Classes

These classes are for employed workers who wish to increase their skills and knowledge in the trade or technical occupation in which they are or have been engaged. These courses offer instruction for workers in skilled or semiskilled occupations. They provide instruction designed to increase or update the knowledge and skills of workers in their trade or occupation. Classes may be established wherever there is a need and where facilities are available for operating the classes.

b. Apprentice Related Instruction Classes

Related instruction is provided for apprentices in unit classes and in classes conducted under the group study plan where small enrollments make it necessary for persons from two or more trades to attend the same class. Apprentices are indentured and supervised in their on-the-job training by the Division of Apprenticeship Training, of the Department of Labor and Industry of Virginia. Their related instruction is a responsibility of the school system under the supervision of the Industrial Education Service of the State Department of Education.

c. Public Service Classes

Classes are held for employees of government agencies including police, surveyors, and others. These courses are designed to increase the skills and technical knowledge of individuals engaged in these specialized occupations.

d. Supervisory Personnel Development Classes

This type of training is intended to upgrade work supervisors, and other minor executives by increasing their supervisory, teaching, and managerial abilities.

e. Specialized Training for Industry

Specialized training for industry may be organized and conducted primarily for a specific industry in a locality under school supervision and control.

f. Adult Preparatory Classes

These classes are for persons not enrolled in public schools, and 17 years of age or older, who are interested in pursuing training in a trade or occupation preparing them for employment. These classes are offered on a part-time basis.

3. HOW THESE PROGRAMS ARE CLASSIFIED AND REPORTED

For purposes of identification and reporting, the programs described in this section are classified as follows:

a. Secondary

(1) Regular Trade Exploratory (TES)
(2) Disadvantaged Trade Exploratory (TES-Dis.)
(3) Handicapped Trade Exploratory (TES)
(4) Regular Trade Preparatory (TPS)
(5) Disadvantaged Trade Preparatory (TPS-Dis.)
(6) Handicapped Trade Preparatory (TPS-Hand.)
(7) Industrial Cooperative Training (ICT)
(8) Regular Health Occupations Preparatory (HOPS)
(9) Disadvantaged Health Occupations Preparatory (HOPS-Dis.)
(10) Handicapped Health Occupations Preparatory (HOPS-Hand.)

b. Adult

(1) Trade Supplementary (TS)
(2) Health Occupations Supplementary (HOS)
(3) Apprentice (Appr.)
(4) Regular Trade Preparatory (TPA)
(5) Disadvantaged Trade Preparatory (TPA-Dis.)
(6) Handicapped Trade Preparatory (TPA-Hand.)
(7) Regular Health Occupations Preparatory (HOPA)
(8) Disadvantaged Health Occupations Preparatory (HOPA-Dis.)
(9) Handicapped Health Occupations Preparatory (HOPA-Hand.)

4. YOUTH ORGANIZATION

Vocational Industrial Clubs of America (VICA) is the national organization for youth preparing for future roles in trade, industrial, technical, and health occupations. Each school is expected to organize a chapter of VICA. The State Department of Education considers this activity an integral

part of the curriculum for all trade and industrial programs. Through participation in club activities, the student has an opportunity to practice leadership skills, engage in job-related contests, and work with others as a member of a team with a common goal.

5. REFERENCES

The trade and industrial education program described above is conducted in accordance with the policies, regulations, and guidance contained in the following documents:

a. Vocational Education Amendments of 1968
Public Law 90-576
90th Congress H. R. 18366

b. Standards of Quality and Objectives for Public Schools of Virginia
Enacted by the General Assembly of Virginia, 1972

c. Virginia State Plan for Vocational Education
State Department of Education
Richmond, VA 23216

*d. A Planning Guide for Trade and Industrial Education Programs in Virginia's Public Schools
State Department of Education
Richmond, VA 23216

*e. Changes in a Planning Guide for Trade and Industrial Education Programs in Virginia's Public Schools
State Department of Education
Richmond, VA 23216

*f. Policies and Standards of Quality Relating to the Initiation and Operation of Trade and Industrial Education Programs in Virginia
State Department of Education
Richmond, VA 23216

g. Handbook for Coordinators of Industrial Cooperative Training in Virginia's Public Schools
State Department of Education
Richmond, VA 23216

h. Guidelines for Initiating Supervised Practical Work Experiences as a Part of a High School Preparatory (Day Trade) Program
State Department of Education
Richmond, VA 23216

*Source documents for some of the materials on the foregoing pages.

TO WORK
OR
TO POST SECONDARY EDUCATION

PHASE IV
Grades 11-12

INDUSTRIAL CAREER PREPARATION
Student specializes in one industrial trade or technology. Takes prerequisites for further education and/or intensive skill training for job entry.

PHASE III
Grades 9-10

INDUSTRIAL CAREER EXPLORATION AND BEGINNING PREPARATION
Student explores one occupational cluster in greater depth. May begin specialization in one trade. May develop entry level skills for some jobs. May change clusters if desired.

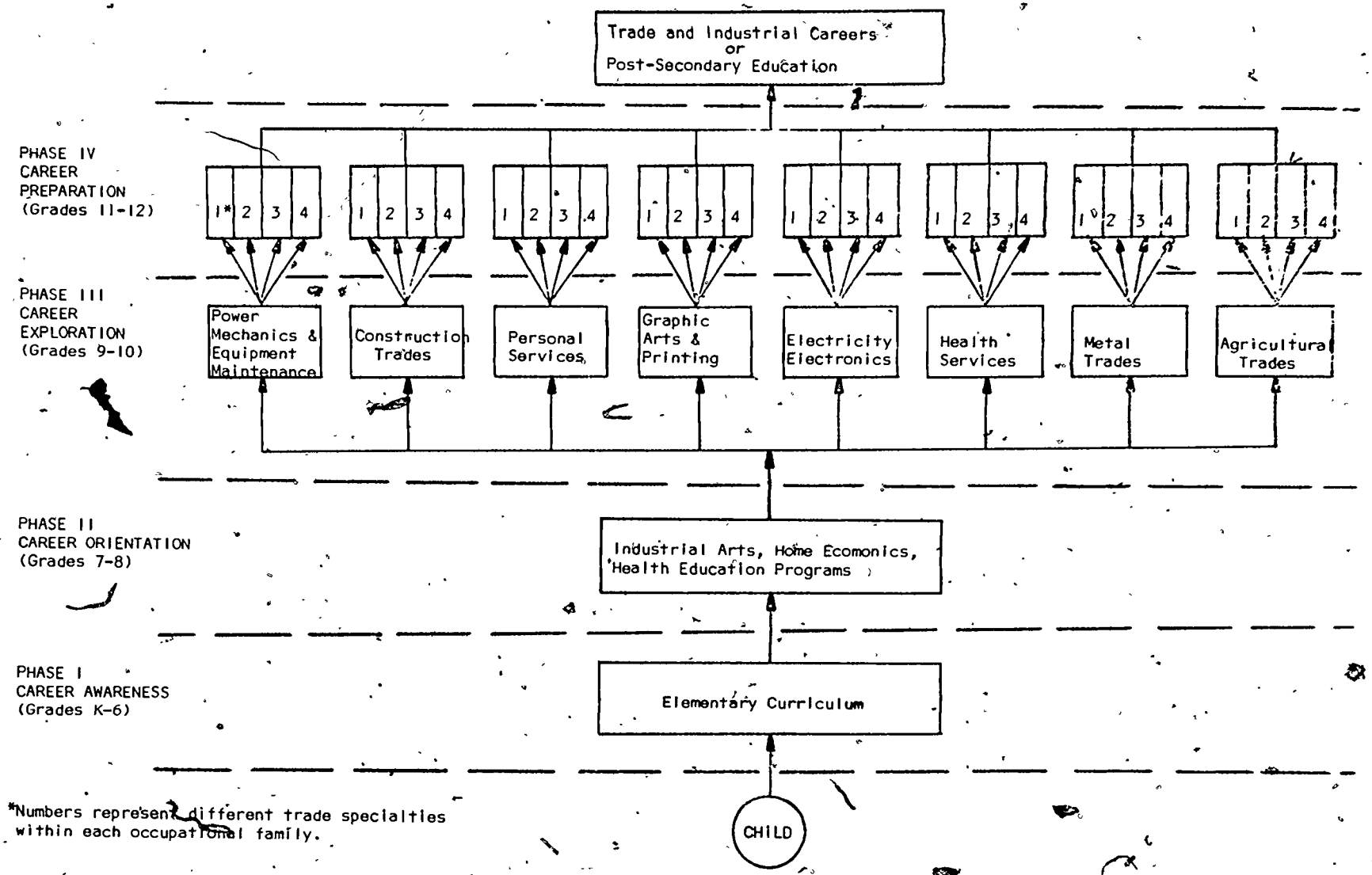
PHASE II
Grades 7-8

INDUSTRIAL CAREER ORIENTATION AND BEGINNING EXPLORATION
Student receives an orientation to the industrial and technological world and its development. Begins exploration of industrial processes and skills

PHASE I
Grades K-6

INDUSTRIAL CAREER AWARENESS
Student is informed about occupations through a series of units representating the entire world of work.

CHART NO. 1 - PROGRAM FOR INDUSTRIAL CAREER DEVELOPMENT



*Numbers represent different trade specialties within each occupational family.

CHART NO. 2 – INDUSTRIAL CAREER DEVELOPMENT FLOW DIAGRAM

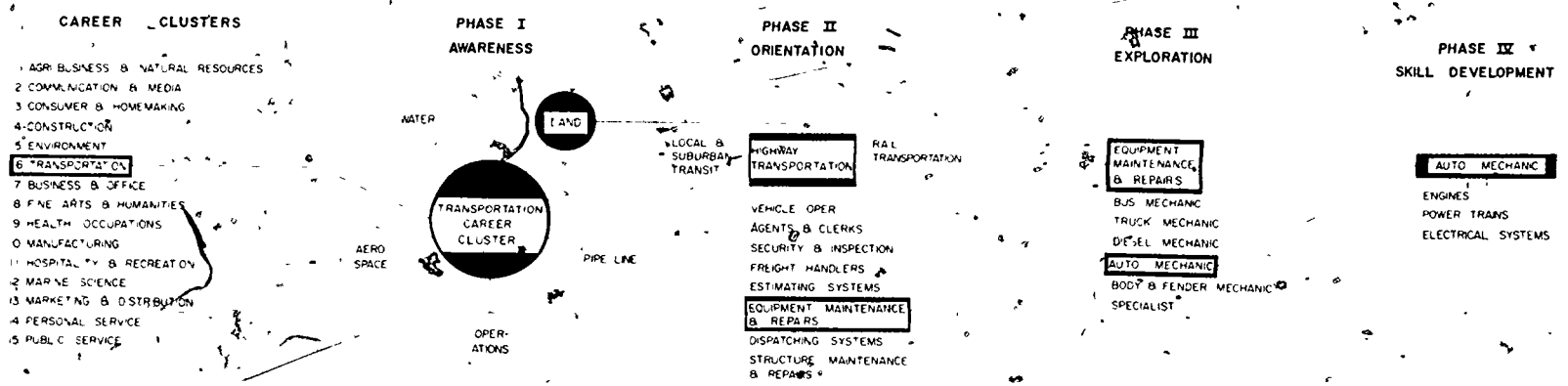


CHART NO. 3 - INDUSTRIAL CAREER DEVELOPMENT SEQUENCE FOR AUTO MECHANICS

FAIRFAX COUNTY PUBLIC SCHOOLS

Trade & Industrial Education Program
1974-75

	Annandale	Chantilly*	Edison*	Fairfax	Falls Church	Fort Hunt	Groveton	Hayfield	Herndon	Jefferson	Lake Braddock	Langley	Lee	Madison	Marshall*	McLean	Mount Vernon	Oakton	Robinson	Stuart	West Spfld.	Woodson*	
Auto Body Repair		X	X												X								
Auto Mechanics		X	X	X	X			X			X		X		X		X		X			X	
Barbering															X								
Carpentry		X																				X	
Cosmetology		X	X		X			X			X				X		X		X			X	
Drafting & Design			X												X							X	
Electricity (Electrician)			X																			X	
Heating & Air Conditioning		X	X																			X	
Industrial Coop. Training		X	X	X	X	X	X	X	X	X	X		X	X	X		X	X	X	X	X	X	
Machine Shop		X																					
Maintenance & Repair	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	
Plumbing			X																				
Practical Nursing			X																			X	
Pre-technical Electronics	X	X	X		X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Printing		X	X	X																			
Television Servicing		X	X		X										X							X	
Trowel Trades (Bricklaying)		X	X												X								
Welding			X																				
Horticulture									X														

* Indicates Industrial Center

CHART NO. 4 - LOCATION OF TRAINING FACILITIES

TRADE AND INDUSTRIAL EDUCATION
Section A
September 3, 1974

PROGRAM OF STUDIES

TRADE AND INDUSTRIAL

GRADES 9-12

SECTION B

TABLE OF CONTENTS

TRADE AND INDUSTRIAL EDUCATION
INDUSTRIAL CAREER PREPARATION
AUTO BODY REPAIR

O. E. Code 170301

D. O. T. Classification 807.381

This program prepares the student for entry into the occupation of automobile-body repairman.

COURSES

Course No. 8676 - Auto Body Repair I

Credits:	3
Minimum Class Time:	480 hours
Maximum Students per Class:	20
Prerequisites:	Completion of 9th grade

Course No. 8677 - Auto Body Repair II

Credits:	3
Minimum Class Time:	480 hours
Maximum Students per Class:	20
Prerequisites:	Completion of Auto Body Repair I

PROGRAM OBJECTIVES

Completion of all objectives of Level I and Level II will prepare the student for entry into employment as a beginning auto body repairman who is able to function independently with a minimum of technical assistance from others. Those who do not complete all of the objectives may still qualify for entry into one or more occupational categories within the trade, such as painter's helper, utility helper, etc.

Performance objectives for this program are set forth below.

Level I - Course No. 9676

Student will:

1. Demonstrate an understanding of the safety hazards involved when using hand and power tools.
2. Identify and demonstrate the use of hand and power tools of the trade.
3. Explain the care and maintenance of hand and power tools used in the trade.
4. Explain the uses of oxy-acetylene welding, identify and explain the function of each piece of equipment, and know the safety precautions that must be followed when using this equipment.

5. Do preliminary preparation and alignment of sheet-metal panels for metal finishing or application of plastic filler.

6. Describe techniques of replacing sheet-metal panels.

7. Demonstrate, using actual equipment, an understanding of why correct alignment is essential in making adjustments to hoods, doors, and trunk lids.

8. Understand the functions and alignment of window glass.

9. Explain the purpose of an automobile frame and identify the different types.

10. Identify and explain the functions of equipment used in spray painting automobiles.

11. Identify and explain the functions of materials used in spray painting automobiles.

12. Mask a vehicle for painting using the proper techniques and procedures.

Level II - Course No. 8677

Student will:

1. Use and maintain hand and power tools safely.

2. Set up oxy-acetylene equipment properly and safely.

3. Weld, braze, and cut metal components of automobile bodies.

4. Align and metal-finish sheet-metal panels.

5. Correctly fill and finish to the original contour using plastic filler.

6. Remove and replace any welded-on sheet-metal panel.

7. Remove and replace front-end sheet-metal, doors, hoods, and trunk lids.

8. Install and align window glass.

9. Identify and operate frame-straightening equipment and alignment gauges.

10. Demonstrate the use of spray painting equipment.

11. Prepare panels for spray painting by cleaning, featherdrying, priming, sanding, and masking.

12. Use estimating and collision manuals to prepare estimates.

TRADE AND INDUSTRIAL EDUCATION
INDUSTRIAL CAREER PREPARATION
AUTO MECHANICS

O. E. Code 170302

D. O. T. Classification 620.281

This program is designed to develop the essential occupational skills and knowledge needed for successful entry into the automotive service and maintenance field as an automobile mechanic.

COURSES

Course No. 8506 - Auto Mechanics I and II

Credits:	3 (1 for Lvl. 1, 2 for Lvl II)
Minimum Class Time:	480 hours (160 for Lvl. 1, 320 for Lvl. II)
Maximum Students per Class:	20 per instructor
Prerequisites:	6th grade or higher reading level, completion of 10th grade or 16 years of age

Course No. 8507 - Auto Mechanics III

Credits:	3.
Minimum Class Time:	480 hours.
Maximum Students per Class	20.
Prerequisites:	Completion of Levels I and II objectives

PROGRAM OBJECTIVES

The objectives of this course are organized into three levels of job competence. Successful completion of each level qualifies the student for specific occupational categories. These are set forth as follows:

Level I consists of a surface study of the whole automobile. Job entry skills at the service station level are developed. In addition, it prepares the student for entry into the Level II program.

Level II is an in-depth study of each unit of the automobile, thus enabling the student to perform repairs on the various components. As a result of completing this level, the student will have job-entry skills as a service station mechanic.

Level III continues with a more in depth study of the automotive system. The student will perform more hands-on operations with emphasis on diagnosis and repair. As a result of having completed this level, the student will be able to meet the dealership job entry requirements as a general mechanic.

Level I - Course No. 8506

Student will:

AUTO MECHANICS
Courses 8506-8507
Section B
September 3, 1974

1. Practice safe work procedures in an automotive service facility

2. Practice correct shop procedures that meet industry standards relative to: (a) rules, (b) cleanliness and maintenance, (c) work order forms.

3. Perform servicing of the following systems at a service station attendant level using vehicles that must be completely operational when completed.
   a. lubrication system
   b. cooling system
   c. exhaust system
   d. fuel system
   e. emission control system
   f. drive line
   g. suspension system
   h. wheels & tires
   i. brake system
   j. batteries & electrical
   k. ignition system
   l. body hardware
   m. car care

4. Fill out necessary forms for efficient shop operation.

Level II - Course No. 8506

Student will:

1. Identify component parts, disassemble, assemble, and describe the basic principal of operation for each of the following:
   a. automotive engines (standard types)
   b. fuel and exhaust systems
   c. standard and automatic transmissions
   d. clutches
   e. drive lines and differentials
   f. steering and suspension
   g. brake system
   h. electrical systems and ignition

2. Perform wheel alignment and balance.

3. Describe the principles of operation and list the components of automotive air conditioning.

Level III - Course No. 8507

Student will:

1. Diagnose troubles and perform corrective service and repairs to the following:
   a. engines
   b. fuel systems
   c. transmissions and drive lines
   d. differentials
   e. suspension and steering
   f. brakes
   g. electrical systems
   h. air conditioning

2. Demonstrate acceptable behavior relative to:
   a. cleanliness
   b. neatness
   c. punctuality
   d. honesty
   e. responsibility

TRADE AND INDUSTRIAL EDUCATION
INDUSTRIAL CAREER PREPARATION
BARBERING AND MEN'S HAIRSTYLING

O. E. Code 172601 D. O. T. Classification 330.371

Barbering and mens hairstyling is a trade-preparatory program whose major components are (1) developing manipulative skills, (2) directly related study, and (3) generally related study.

Developing Manipulative Skills

Students practice the manipulative skills of the barber on patrons who request such services while under supervision of the barbering instructor. This activity is conducted in a school facility completely equipped with the tools and fixtures of the barbering trade and approved by the Virginia State Board of Barbering Examiners.

Directly Related Study

Coordinated in-school study of the science, mathematics, and related technology needed for advancement in the barbering industry.

Generally-Related Study

In-school study and guest-artist exposure to the needs of the industry so that the student may choose the direction in which he/she wishes to go.

COURSES

Course No. 8509 - Barbering and Men's Hairstyling I

Credits:	3
Minimum Class Hours:	480 hours
Maximum Students per Class:	20
Prerequisites:	Completion of 8th grade or 14 years of age

Course No. 8510 - Barbering and Men's Hairstyling II

Credits:	3
Minimum Class Hours:	480 hours
Maximum Students per Class:	20
Prerequisites:	Completion of Level I Objectives

Course No. 8511 - Barbering and Men's Hairstyling III

Credits:	3
Minimum Class Hours:	480
Maximum Students per Class:	20
Prerequisites:	Completion of Level II Objectives

BARBERING AND MEN'S HAIRSTYLING
Courses 8509-8510-8511
Section B
September 3, 1974

PROGRAM OBJECTIVES

The primary goal of this program is to develop the skills, information, attitudes, and understandings which will enable the student to enter employment as an apprentice barber and progress satisfactorily in accordance with the interest of the individual. This program meets the requirements of the Virginia State Board of Barber Examiners and qualifies the student to take the Virginia apprentice barber examination.

Performance objectives for the program are set forth below.

Level I - Course No. 8509

Student will:

1. Complete a haircut under supervision of the instructor.
2. Complete a shave, trim beards, and trim mustaches under the supervision of the instructor.
3. Hone and strop a straight razor.
4. Give a plain shampoo properly.
5. Give an oil shampoo properly.
6. Recognize and treat dandruff conditions.
7. Give various facials properly.
8. Use light therapy.
9. Use proper linen setup for services.
10. Practice hygiene in shop.
11. Sterilize and care for implements.
12. Demonstrate general knowledge of bacteriology.
13. Demonstrate knowledge of the history of barbering.
14. Make conversation with customer.
15. Give ethical treatment to customer and competitor.

Level II - Course 8510

Student will:

1. Complete a haircut with minimum supervision.
2. Complete a shave, trim beards, and trim mustaches.
3. Recognize disorders of the skin.
4. Give scalp and hair treatments.
5. Identify components of cell structure and explain their functions.
6. Explain bone structure of the skull.
7. Name the important muscles of the head and face.
8. Explain the functions of the nervous system.
9. Explain the structure and function of the circulatory system.
10. Explain the function of the endocrine system.
11. Explain the function of the excretory system.
12. Explain the function of the respiratory system.
13. Explain the function of the digestive system.
14. Identify components of the skin and scalp and explain their functions.
15. Explain the structure and function of hair.

Level III - Course No. 8511

Student will:

1. Complete a haircut without supervision.
2. Exhibit a professional manner in performing all of the barber services.
3. Demonstrate basic understanding of the chemistry of cosmetics.
4. Explain the requirements for success as a barber, shop owner, or manager.
5. Explain the kind and purpose of records kept in the barber shop.
6. Demonstrate the proper approach to finding employment.

7. Qualify for the Virginia State Board of Barber Examiners apprenticeship exam.

8. Pass the Virginia State Board of Barber Examiners apprenticeship exam.

TRADE AND INDUSTRIAL EDUCATION
INDUSTRIAL CAREER PREPARATION
BRICKLAYING

O. E. Code 171004 D. O. T. Classification 861.381

The purpose of this course is to teach the students the basic manipulative skills and the related information essential for entry into and advancement in the field of brickmasonry as an apprentice mason.

COURSES

Course No. 8512 - Bricklaying I

Credits:	3
Minimum Class Time:	480 hours
Maximum Students per Class:	20
Prerequisites:	Completion of 9th grade

Course No. 8513 - Bricklaying II

Credits:	3
Minimum Class Time:	480 hours
Maximum Students per Class:	20
Prerequisites:	Completion of Level I objectives

PROGRAM OBJECTIVES

This course is taught over a two-year period. The first year is designed to teach the following basic manipulative skills in bricklaying:

a. Mixing mortar
b. Making material transfers
c. Spreading mortar
d. Laying brick and cinderblock
e. Striking and brushing masonry walls
f. Mastering the mason's level
g. Laying brick and block to a mason's line

During the second year the students will obtain actual on-the-job training. All of the skills that the student has developed during the previous year can now be incorporated and used on the job. The county's vocational section has formed a nonprofit corporation to build projects throughout the county.

Performance objectives for the program are set forth below.

Level I - Course No. 8512

Student will:

1. Demonstrate an understanding of the following items through written examination

a. Trade terms
b. History and development of bricklaying
c. Mortar properties and types
d. Manufacturing of brick and block
e. Bonds and patterns
f. Mason's spacing and modular rule
g. Blueprint reading
h. Footing and foundations
i. Estimation of masonry materials and concrete
j. Job orientation.

2. Identify and write or recite the safety practices involving tools and equipment and the rules and regulations that are enforced within the laboratory and on a job site under instructor supervision.

3. Properly care for and maintain the hand tools and equipment used by the masonry trade.

4. Mix masonry mortar by hand and machine adhearing to local building and A.S.T.M. specifications.

5. Properly manipulate the trowel in the following areas:

a. Tempering mortar
b. Making motar transfers from pan to masonary base.
c. Furring and cutting off excess
d. Cutting masonry units

6. Properly tool mortar joints, and remove excess mortar from the face of masonry units.

7. Level, plumb, and straight edge using the masonry level in basic masonry composite corner or angle lead and wall construction.

8. Properly transfer and set up materials for various working stations.

9. Use a masonry line and course rule in the construction of a basic 4" brick, 8" brick, and block wall incorporating various masonry bonds (structural, pattern, mortar) while working from the inside of the masonry wall.

10. Lay out and build window and door jambs incorporating the masonry course rule, masonry line, and angle irons while working from the inside of the masonry wall.

11. Set up, stock with materials, and work safely and productively on both hopping boards and tubular scaffolding for brick on cinderblock walls.

12. Build, strike, and water proof 8" masonry sills while working from the inside of the wall. (a) rollock (b) flat.

13. Construct 4", 8", or 12" cinderblock walls using a masonry line and masonry course rule, while working from the inside of the masonry wall.

14. Build a brick veneer wall incorporating the mason's line and masonry course rule, while working from the face of the masonry wall.

15. Construct projects that will incorporate all tasks involving plumb rule skills and line skills developed during the year.

Level II - Course No. 8513

Student will:

1. Demonstrate an understanding of the following items through written examination:

   a. Estimating
   b. Step construction
   c. Chimney design and construction
   d. Barbecue and fireplace construction
   e. Arch construction
   f. Pavements and patios
   g. Ornamental brickwork
   h. Job and project management

2. Lay out and build masonry arches.

3. Construct a masonry chimney according to building code specifications.

4. Construct masonry pavements on concrete or sand bases.

5. Build masonry steps.

6. Build a masonry barbecue and the various segments of a fireplace.

7. Build circular, or serpentine, masonry walls with or without a templet.

8. Lay out and range a rectangle build in the shop using a framing square and line, or a transit level.

9. Construct panel walls incorporating various different pattern and pavement bonds.

TRADE AND INDUSTRIAL EDUCATION
INDUSTRIAL CAREER PREPARATION
CARPENTRY

O.E. Code 171001 D. O. T. Classification 860.381

Carpentry is a trade-preparatory program consisting of (1) classroom-related instruction, (2) demonstrations on building procedures and techniques, and (3) on-site live project construction.

Classroom Instruction

Students receive related instruction in all areas of construction with emphasis on house construction.

Demonstrations

Demonstrations are given on materials and processes that the student will be involved with in home construction.

On-Site Live Project

The student receives experience on construction site putting to practice information and skills studied in the classroom and laboratory.

COURSES

Course No. 8518 - Carpentry I

Credits:	3
Minimum Class Time:	480 hours
Maximum Students per Class:	20
Prerequisites:	Completion of 9th grade

Course No. 8519 - Carpentry II

Credits:	3
Minimum Class Time:	480 hours
Maximum Students per Class:	20
Prerequisites:	Achievement of Carpentry I objectives

PROGRAM OBJECTIVES

The primary goal of this program is to equip the student with job-entry level skills in carpentry.

Performance objectives of the program are set forth below.

CARPENTRY
Courses 8518-8519
Section B
September 3, 1974

Level I - Course No. 8518

Student will:

1. Read and interpret basic architectural blueprints.
2. Demonstrate an understanding of laboratory and on-site safety.
3. Use the basic tools of the carpentry trade.
4. Estimate materials needed for simple construction projects.
5. Lay out and fabricate floor framing.
6. Install sub-floor.
7. Lay out and fabricate wall framing.
8. Install sub-siding.
9. Lay out and fabricate ceiling joist and rafters.
10. Install roof sheathing.
11. Prepare forms for concrete construction.

Level II - Course No. 8519

Student will:

1. Lay out footers and foundations.
2. Install windows.
3. Install exterior doors.
4. Install exterior siding.
5. Install exterior trim.
6. Install insulation in ceilings, walls, and floors if applicable.
7. Apply interior ceiling.
8. Apply interior wall coverings.
9. Install finish stairs.
10. Install finish floor.

11. Install interior doors.

12. Install interior trim.

TRADE AND INDUSTRIAL EDUCATION
INDUSTRIAL CAREER PREPARATION
COSMETOLOGY

O. E. Code 172602 D. O. T. Classification 332.271

This program is designed to develop the skills and knowledge needed to pass the Virginia State Board of Registered Professional Hairdressers Examination for Licensing.

This requires the completion of 1500 hours of training in cosmetology, plus an additional 500 hours in related courses such as general science, biology, mathematics, English, and health.

COURSES

Course No. 8527 - Cosmetology I

Credits:	3
Required Mimimum Hours:	500
Maximum Students per Class:	20
Prerequisites:	At least 16 years of age or completion of ninth grade and physically, emotionally stable.

Course No. 8528 - Cosmetology II

Credits:	3
Required Minimum Hours:	500
Maximum Students per Class:	20
Prerequisites:	Successful completion of course #8527

Course No. 8529 - Cosmetology III

Credits:	3
Required Minimum Hours:	500
Maximum Students per Class:	20
Prerequisites:	Successful completion of course #8528

PROGRAM OBJECTIVES

Satisfactory completion of Level I will prepare the student for several occupations such as: shampooist, manicurist, receptionist, and dispensary technician.

Level I - Course No. 8527

Student will:

1. Demonstrate an understanding of the objectives of the program.

2. Conform to the State Department of Professional and Occupational Registration and state laws relating to the cosmetology field.

3. Develop and practice the principles of professional ethics, hygiene, visual poise, personality development, sterlization, measurements, sanitation and bacteriology.

4. Maintain good professional relationship with employer, co-workers, patrons, professional organizations and clubs.

5. Demonstrate proper handling of implements when giving a manicure and pedicure.

6. Employ proper techniques in basic hairshaping, fingerwaving, thermal waving, curling iron, blow waving, hair and wig styling.

7. Demonstrate skill in permanent waving, chemical relaxing, hair coloring and hair pressing.

8. Demonstrate skill in superfluous hair removal.

9. Employ cosmetics as necessary for facials and cosmetic makeup.

10. Practice proper safety procedures, and recognize safety hazards in using electrical equipment.

11. Identify the various electrical equipment for use in the cosmetology field.

12. Function in the role of a receptionist and dispensary clerk

Level II Course No. - 8528

Student will:

1. Exhibit behavioral traits which are conducive to succeeding in the world of work, particularly in the areas of attitude, work habits, speech, and self-dicipline.

2. Recognize that the earning power of the cosmetologist depends upon the quality of workmanship and personality.

3. Perform in a laboratory setting and apply related knowledge to laboratory procedures.

4. Demonstrate an understanding of effective business principles, business laws, insurance, salesmanship, and psychology.

5. Express thoughts clearly in speaking, writing, reading, and listening.

Cont. #8528

Student will:

6. Demonstrate the basic safety practices required by the cosmetology curriculum.

7. Evaluate specific professional considerations with regard to earnings, prestige, stability, training, mobility, geographic locations, and physical demands.

8. Evaluate the different skills for future opportunities.

9. Operate visual equipment in the laboratory and classroom.

10. Seek a position through local newspapers, trade journal, state employment agencies and know the fields of specialization available in these occupations.

11. Identify the parts of the human body and interrelationship as they relate to the needs and reactions of patrons.

Level III Course No. - 8529

Student will:

1. Outline practices that increase business and build confidence.

2. Select and use properly, commercial products that are related to the rendering of beauty services.

3. Demonstrate speed and expertise in performing basic manipulative skills and the application of related information.

4. Master and maintain current trends needed to obtain useful employment in the professional progressive salon.

5. Use the various types of audiovisual material of the course.

6. Write a resume and conduct a telephone call for a position; complete the forms for job application, Social Security, and tax forms.

7. Design a floor plan and prepare an equipment list for a beauty salon.

8. Practice proper sterlization, sanitation and safety procedures.

9. Demonstrate competence in mathematical skills as utilized in the trade.

10. Demonstrate the correct use of light therapy equipment including conformence with all necessary safety rules.

Cont. #8529

11. Solve problems of application of basic concepts and principles of chemistry as related to cosmetology.

12. Review and finalize all materials covered and display a professional attitude at State Board Examinations.

TRADE AND INDUSTRIAL EDUCATION
INDUSTRIAL CAREER PREPARATION
DRAFTING AND DESIGN

O. E. Code 171300

D. O. T. Classification 001.281
003.281
007.281

This is a trade preparatory program with the following major components: (1) basic drafting techniques, (2) architectural drafting and (3) engineering drafting.

Basic Techniques

A course designed to help the student learn the fundamentals of drafting. He /she will develop the basic skills of drawing, and develop an understanding of the technical processes dependent upon this subject. This course is intended to prepare the student for continued activity in the related areas of engineering, drawing, and architectural drawing.

Architectural Drafting

Covers principles of building, planning and construction and the relationship between the drafting of plans and development of the structure.

Emphasis is placed on the development of skills which will enable the student to understand the language of the architect and related engineering counterparts. The student develops the necessary drafting skills to communicate ideas and concepts in an understandable manner.

Engineering Drafting

Development of skills needed to succeed in fields related to engineering. These should include areas of structural, electrical, mechanical, or other areas of specialization. Student is introduced to instrumentation techniques used in the research and development area, and becomes familiar with the various consulting fields that support the mainstream of industry.

COURSES

Course No. 8530 - Drafting and Design I

Credits:	3
Minimum Class Time:	480 hours
Maximum Students per Class:	20
Prerequisites:	Completion of Industrial Arts Mechanical Drawing course desirable

Course No. 8531 - Drafting and Design II

Credits:	3
Minimum Class Time:	480 hours

DRAFTING AND DESIGN
Courses 8530-8531
Section B
September 3, 1974

Maximum Students per Class: 20
Prerequisites: Completion of Level I objectives.

PROGRAM OBJECTIVES

The primary goal of this program is to equip the student with job-entry level skills in the field of drafting. The program will, through its various stages, develop basic knowledge and skills in the different types and special areas of drafting. Along with the specialized training, the program will help the student gain an understanding of industry and technology.

Level I Course No. - 8530

Student will:

1. Identify drafting related occupations in the world of work.
2. Apply basic skills in use of equipment and supplies.
3. Apply skills to various drawing problems encountered in the field.
4. Demonstrate proper techniques of lettering required by field employers.
5. Apply principles of orthographic projection to problem solving.
6. Demonstrate proper notation and dimensioning used by the industry.
7. Convey design concepts and procedures into forms necessary to insure proper quality control.
8. Recognize types and sizes of welds used on working drawings.
9. Select proper views to describe internal construction of an object.
10. Choose the type and placement of an auxiliary view to indicate true shape of inclined surfaces.
11. Select proper fastening devices available on the market to meet design needs.
12. Recognize various types of working drawings used in industry, such as details, sub-assemblies, and assemblies.
13. Apply various techniques of pictorial representation to problem solving.
14. Utilize developments and intersections accurately so that products can be fabricated directly from patterns.
15. Use proper graphic techniques on appropriate graphs or charts to convey correct information to the problem.

16. Draw different types of cams and gears used in problem solving.

17. Transmit correct design information to fabrication and assembly drawing..

18. Understand drawing conventions in developing working drawings of plans, evaluations, sections, and details.

19. Convey appropriate electrical symbols and drafting techniques to working drawings.

20. Use standard symbols and conventions to convey piping data to working drawings.

21. Transfer engineering designs from sketch and calculation form to standard conventions recognized by trade craftsmen.

22. Restate information from field notes to finished drawings.

Level II Course No. - 8531

Student will:

1. Use precision measuring instruments such scales, calipers, gauges, etc.

2. Read and understand drawings, such as sheet metal, mechanical, welding, architectural, electronics, electrical, hydraulic, topographic, etc.

3. Prepare a drawing from engineer's notes in any of the specific subject areas shown above.

4. Utilize drawing numbering systems, filing systems, and reproduction methods.

5. Demonstrate a drawing change concept, such as incorporation, implementation, approval, and release.

6. Demonstrate an understanding of shop operations and the dissemination of drawings during the manufacturing cycle.

7. Formulate fonts lifts and proper "use on" codes, next assembly designations, and change releases.

8. Demonstrate "entry level" proficiency with the air brush for use in photo retouching and developing.

9. Understand the various types of materials and their uses, such as metals, woods, and synthetics; the properties and strengths of these materials.

10. Understand heat-treating of metals, and its application and uses.

11. Utilize all prior drafting skills to solve graphic problems and communicate concepts and formulate construction.

12. Develop transitions and fittings for use in heating or air-conditioning duct-work using full size pattern layout.

13. Prepare graphic illustrations of numerical data for purposes of group interpretation.

14. Design a power train for transmission of work force from one direction to another using multiple gearing and/or cam action.

15. Incorporate proper conventions to convey design information on the following work drawings: (a) steel fabrication, (b) floor plans, (c) elevations, (d) sections, (e) details.

16. Prepare and appraise schematic diagrams as well as printed circuit layouts.

17. Relate engineering data from notations and calculations form to graphic detail for production-assembly purposes.

18. Compile field notes and restate data in graphic form, using proper conventions and operations.

19. Compose and write a letter of application for employment.

20. Prepare a resume of his/her occupational experience and qualifications for employment.

21. Complete a typical job application form and explain the reason for each.

22. Exhibit behavioral traits which are conducive to succeeding in the world of work, particularly in the areas of attitude, work habits, speech, and self-dicipline.

TRADE AND INDUSTRIAL EDUCATION
INDUSTRIAL CAREER PREPARATION
ELECTRICITY

O. E. Code 171002 D. O. T. Classification 824.281

This program is a trade preparatory program designed to develop the occupational competency of the student to the entry level of the electrician's trade. This is accomplished through (1) directly related study, (2) practical exercises, (3) on the job training, and (4) study of generally related information.

Directly Related Study

In-classroom study of the technical information necessary to prepare the student for entry into the electrician's trade.

Practical Excercises

Development of the manipulative skills required for entry into the electrician's trade.

On-the-Job Training

Actual job-site training, to increase skill and knowledge in the electrical and associated trades.

Generally Related Information

Information necessary to improve the social and working relationships between the various trades as well as the community.

COURSES

Course No. 8533 - Electricity I

Credits:	3
Minimum Class Time:	540 hours
Maximum Students per Class:	20
Prerequisites:	Completion of at least 10th grade

Course No. 8534 - Electricity II

Credits:	3
Minimum Class Time:	540 hours
Maximum Students per Class:	20
Prerequisites:	Completion of 11th grade and Level I objectives.

ELECTRICITY
Courses 8533-8534
Section B
September 3, 1974

PROGRAM OBJECTIVES

To develop the essential occupational skills and knowledge necessary for successful entry into the electrical trade.

To develop safe, orderly and reliable work habits.

To develop behavioral attitudes and appreciations conducive to high standards of craftmanship, leadership, and citizenship.

To develop initiative, responsibility, and self-reliance as a worker so that he/she may intelligently deal with the problems of the trade.

To develop ability to work cooperatively with fellow tradesman regradless of their level of competence or ability.

JOB-ENTRY LEVEL - DEFINITION

As pertains to the electrical trade, "job-entry level refers to "Any individual that is capable of recognizing, installing, or maintaining electrical material or equipment in any phase of electrical work with the minimum of supervision."

The total electrical program consists of eight blocks of instruction; four blocks in Level I, and four blocks in Level II. The objectives for these eight blocks of instruction are:

Level I - Course No. - 8533

Block I- Electrical Fundamentals
Student will:

1. Define basic electrical terms.
2. Manipulate basic electrical formulas.
3. Use basic test equipment.
4. Wire basic electrical circuits.

Block II - Alternating Current and Residential Wiring I
Student will:

1. Explain and apply single phase alternating current circuit theories.
2. Work successfully with the National Electrical Code and its authority.
3. Recognize and install basic residential wiring components and materials.

Block III - Residential Wiring II
Student will:

1. Determine materials required for residential wiring.
2. Determine service requirements for residence.
3. Estimate the cost of labor and material required for residential wiring.

Block IV - Residential Wiring III
Student will:

1. Install residential service equipment.
2. Install residential low-voltage systems.
3. Sucessfully wire single-family dwellings.

Level II - Course No. - 8534

Block V - Appliance and Motor Service
Student will:

1. Explain thermal principles.
2. Explain magnetics principles
3. Maintain and repair small and major electrical appliances.

Block VI - Industrial Wiring
Student will:

1. Explain transformer principles.
2. Demonstrate knowledge of three phase circuitry.
3. Explain the principles of power, transmission and distribution.

Block VII - Commercial Wiring
Student will:

1. Install and maintain conduit systems.

Block VIII - Control Wiring
Student will:

1. Install and maintain low- and line voltage control systems.
2. Explain the operation of basic electronic devices.

TRADE AND INDUSTRIAL EDUCATION
INDUSTRIAL CAREER PREPARATION
HEATING AND AIR CONDITIONING

O. E. Code 170100

D. O. T. Classification 637.281

Heating and air conditioning is a trade-preparatory program whose major components are (1) directly related study, (2) practical experience, (3) generally related study, (4) on-the-job training.

Directly Related Study

Coordinated in-school study of the specific technical information needed in the heating and air-conditioning trades.

Practical Experience on Live Equipment

Planned and supervised laboratory work experience on live equipment to master the basic skills and techniques required in the trade.

Generally Related Study

In-school study of the general information and skills needed to succeed as a tradesman.

On-the-Job Training

Actual job site training to develop job-entry-level competency in the heating and air conditioning and associated trades.

COURSES

Course No. 8503 - Heating and Air Conditioning I

Credits:	3
Minimum Class Time:	320 hours
Minimum Practical Exercise Experience:	160 hours
Maximum Students per Class	20
Prerequisites:	Completion of 9th grade, Completion of 10th grade preferred

Course No. 8504 - Heating and Air Conditioning II

Credits:	3
Minimum Class Time:	160 hours
Minimum Practical Exercise Experience:	320 hours
Maximum Students per Class	20
Prerequisites:	Completion of Level I objectives

HEATING AND AIR CONDITIONING
Courses 8503-8504
Section B
September 3, 1974

PROGRAM OBJECTIVES

The primary goal of this program is to equip the student with job - entry-level skills in the heating and air-conditioning trades. It trains students in the repair, maintenance, and installation of all types of domestic and commercial, heating, refrigeration, and air-conditioning equipments. Instruction includes layout and fabrication of sheet metal ducts and repair and installation of humidification and dehumidification equipment.

Performance objectives for these courses are set forth below.

Level I - Course No. 8503

Student will:

1. Make flares by mechanical method using soft drawn copper tubing.
2. Make swedge connections using soft copper.
3. Make constriction connections using soft copper.
4. Bend tubing to various angles.
5. Perform soft solder connections on copper tubing.
6. Perform hard solder connections on copper tubing.
7. Disassemble and reassemble reciprocating compressors.
8. Select, repair, and install condensers.
9. Select, install, and adjust metering devices.
10. Select, repair, and install evaporators.
11. Select, repair, and install receivers.
12. Select, install, and adjust pressure and temperature actuated controls.
13. Charge and evacuate small refrigeration units.
14. Demonstrate an understanding of the basic principles of electrical circuits.
15. Select and install conductors, insulators, fuses, and circuit breakers.
16. Differentiate between series and parallel connected circuit components.
17. Read and interpret electrical wiring diagrams.

18. Select and use correctly various electrical measuring devices.

19. Solder, splice, and use special connectors for electrical wiring.

20. Diagnose, service, and repair refrigerator units.

21. Demonstrate an understanding of domestic heating systems.

22. Make minor repairs on gun-type oil burners.

23. Select, repair, and install electrical controls on gas and oil burners.

24. Fabricate simple sheet metal ducts and fittings.

25. Fabricate and install ducts from sheet metal.

Level II - Course No. - 8504

Student will:

1. Remove and add oil to refrigeration systems.

2. Trouble shoot small refrigeration units.

3. Install and repair hermetically sealed refrigeration units.

4. Install defrost systems.

5. Repair water coolers.

6. Repair automatic ice makers.

7. Repair beverage and milk coolers.

8. Repair reach-in and walk-in coolers.

9. Repair and install meat and showcases.

10. Repair and install multiple units.

11. Trouble-shoot commercial refrigeration units.

12. Repair and install freezers.

13. Repair and install truck-mounted refrigeration units.

14. Repair and install residential and commercial air-conditioning units.

15. Repair and install humidifiers.

16. Repair and install dehumidifiers.

17. Design and fabricate air-distribution system using sheet metal.

18. Solder and make seams in sheet metal fabrications.

19. Select, design, and install complete heating and air-conditioning system.

20. Diagnose troubles in heating and air conditioning systems, repair and restore to normal operation.

TRADE AND INDUSTRIAL EDUCATION
INDUSTRIAL CAREER PREPARATION
INDUSTRIAL COOPERATIVE TRAINING

Industrial Cooperative Training is a trade-preparatory program whose major components are (1) on-the-job training, (2) directly related study, and (3) generally related study.

On-the-Job Training

Students should receive 15 class periods per week of on-the-job training with approved participating employers for which they are paid a wage by their employers.

Directly Related Study

Coordinated in-school study of the specific trade information and skills in which the student is receiving on-the-job training.

Generally Related Study

In-school study of the information and skills all workers need to succeed in a career.

COURSES

Course No. 8901 - Industrial Cooperative Training I

Credits:	3
Minimum Class Time:	160 hours
Minimum O.J.T. Experience:	480 hours
Maximum Students per Class:	20
Prerequisites:	At least 16 years of age Completion of 10th grade

Course No. 8902 Industrial Cooperative Training II

Credits:	3
Minimum Class Time:	160 hours
Minimum O.J.T. Experience:	480 hours
Maximum Students per Class:	20
Prerequisites:	Achievement of ICT Level I objectives At least 16 years of age Completion of 11th grade

PROGRAM OBJECTIVES

The primary goal of this program is to equip the student with job-entry-level skills in an industrial or health occupation.

Performance objectives for the job-related skills phase of the program are to be developed cooperatively with the ICT oordinator and the employer for each student. These may be selected completely or in part from those developed for the regular non-cooperative trade programs.

Performance objectives for the generally related phase of the program are set forth below:

Level I - Course No. - 8901

Student will:

1. Compose and write a letter of application for employment, of resignation, and declining an offer of employment.
2. Prepare a resume of his/her occupational experience and qualifications for employment.
3. Complete a typical job application form and explain the reason for each question asked in the form.
4. Secure, prepare for, and experience a job interview.
5. Explain how his/her total earnings and take-home pay are computed at the end of each pay period.
6. Explain the concepts on which Social Security, unemployment, and workman's compensation are based.
7. Apply for benefits under the Social Security, unemployment, and workman's compensation programs.
8. Exhibit behavioral traits which are conducive to succeeding in the world of work, particularly in the areas of attitude, work habits, speech, and self-dicipline.
9. Apply effective study techniques to prescribed directly related study materials.
10. Complete correctly federal, state, and local tax returns.
11. Comprehend and define union goals, and describe union methods and accomplishments.
12. Comprehend and define employer goals and describe employer methods in dealing with organized labor.
13. Prepare a personal budget.
14. Recognize safety hazards at place of work and cite proper corrective measures.

15. Prepare a job task analysis related to his/her work assignment.

16. Identify specific occupations and work characteristics which embrace his/her occupational aptitudes and interests.

Level II - Course No. - 8902

Student will:

1. Outline the different forms of wage payment and identify the factors which determine why one job pays more than another.

2. Recognize typical circumstances involving business transactions under which it is advisable to engage an attorney.

3. Explain his/her rights and obligations with respect to employment, borrowing money, credit, property, and services.

4. Analyze accidents and identify their cause.

5. Evaluate specific occupations with respect to earnings, prestige, stability, training, mobility, geographic locations, and physical demands.

6. Identify the advantages and disadvantages of pay increases and promotions based on the merit and the length-of-service principle.

7. Identify and describe reasons for which a company is justified in dismissing, suspending, reprimanding, or laying off an employee.

8. Identify and describe the tangible and intangible factors which will be considered when employees are reviewed for promotion on salary increase.

9. Identify and describe the factors which must be examined in evaluating the feasibility of starting a business.

10. Conduct and participate in a formal and an informal meeting.

11. Identify and describe the major kinds of insurance coverage.

12. Explain and describe what credit is, how it is used, and what it costs.

13. Explore, identify, and describe major problems facing business and industry.

14. Select and evaluate a company for full-time, permanent employment.

15. Identify and evaluate post high school training opportunities.

TRADE AND INDUSTRIAL EDUCATION
INDUSTRIAL CAREER PREPARATION
MACHINIST TRADE

O. E. Code 172300 D. O. T. Classification 600.280

This program provides instruction of a preparatory type in the development of basic manipulative skills, safety, judgement, technical knowledge, and related industrial information for purpose of preparing a person for useful employment in a machine shop or related occupation.

COURSES

Course No. 8539 - Machine Shop I

Credits:	2
Class Time:	360 hours
Maximum Students per Class:	20
Prerequisites:	Completion of 10th grade

Course No. 8540 - Machine Shop II

Credits:	3
Class Time:	540 hours
Maximum Students per Class:	20
Prerequisites:	Completion of Level I objectives.

The machinist is a skilled metal worker who shapes metal and non-metal parts using machines and hand tools. He/she is able to select the proper tools and materials required for each job, and to plan the operations in their proper sequence so that the work can be finished according to blueprints or written specifications. He/she is able to interpret blueprints and read precision measuring instruments.

The machinist is able to set up and operate the basic machine tools, such as the drill press, lathe, milling machine, etc. He/she selects the appropriate machine tools and cutting tools that will turn raw materials into an intricate, precise part.

PROGRAM OBJECTIVES

Performance objectives for the program are set forth below:

Level I - Course No. - 8539

Student will:

1. Read and use precision and semi-precision measuring tools and instruments.

2. Use in a safe manner, machine shop hand tools, e.g., files, wrenches, hammers, taps and dies, chisels, etc.

3. Set up and operate in a safe manner the drill press; drilling, reaming, and countersinking holes.

4. Grind tools for the lathe, sharpen a chisel and dress the wheel on a bench or pedestal grinder.

5. Face, turn, knurl, and chase screw threads on the engine lathe in a safe manner.

6. Install the saw band, cut stock to length and on an angle using the horizontal band saw.

7. Cut and weld saw blade, saw contour by hand-feed method, and cut inner circle from flat plate on the vertical band saw.

8. Set up and shape a horizontal surface and cut a workpiece square and parallel on the shaper.

9. Set up the vertical milling machine to mill square or rectangular stock to size and mill keyways in round stock.

10. Select, mount, and dress wheel with diamond and grind workpiece square on the surface grinder.

11. Develop an insight and understanding of his or her chosen occupation and its place in our society.

12. Understand the relationship between effective personal qualities and vocational success.

13. Understand the application of basic principles of science and mathematics and of the related technical knowledge that condition the manipulative skills.

14. Through the Vocational Industrial Clubs of America program, develop leadership qualities, and vocational and personal relations which will lead to good citizenship.

Level II - Course No. - 8540

Student will:

1. Measure with the fine precision tools, such as the bevel protractor, gage blocks, and sine bar.

2. Select the correct feeds and speeds on the drill press for counterboring, spot-facing, and tapping.

3. Sharpen and/or flat-bottom high speed drills using the bench or pedestal grinder.

4. Use the engine lathe for turning angles, set up the workpiece with the steady and follower rests. Bore inside diameters to precision dimensions.

5. Set up the vertical band saw for hydraulic feed sawing operations. Saw discs using the circle cutting attachment.

6. Combine vertical and horizontal cuts, and cut keyways in a workpiece on the sharper.

7. Set up and center workpiece on the vertical milling machine using the rotary table. Indicate spindle square to work table and precision bore diameters in a workpiece.

8. Face, slab, and straddle-mill a workpiece using the horizontal milling machine. Set up and cut gears utilizing the indexing attachment.

9. Precision surface-grind angular, slot, and groove surfaces.

10. Case-harden, oil-harden, temper, and normalize finished projects using the electric furnace.

11. Improve the leadership qualities, and vocational and personal relationships developed through the Vocational Industrial Clubs of America program.

TRADE AND INDUSTRIAL EDUCATION
INDUSTRIAL CAREER EXPLORATION - PREPARATION
MAINTENANCE AND REPAIR

O. E. Code 171099

Maintenance and Repair is a special program provided at grades 9-12 for disadvantaged students. It is intended to serve students who have experienced difficulties believed to arise from one or more of the following causes:

1. Social (those with personality, home, or emotional problems)
2. Economic (those from low-income homes)
3. Academic (those who have not developed the ability to master the requirements for progress toward high school graduation)

COURSES

Course No. 8542 - Maintenance and Repair I

Credits:	2
Minimum Class Time:	320 hours
Maximum Students per Class:	15
Prerequisites:	None

Course No. 8543 - Maintenance and Repair II

Credits:	2
Minimum Class Time:	320 hours
Maximum Students per Class:	15
Prerequisites:	Maintenance and Repair I

Course No. 8544 - Maintenance and Repair III

Credits:	2
Minimum Class Time:	320 hours
Maximum Students per Class:	15
Prerequisites:	Maintenance and Repair II

PROGRAM OBJECTIVES

The primary goal of this program is to provide the students with a broad, general, overview of the knowledge and skills involved in selected trades or occupations.

Job-entry skills are developed in one or more of these trades to the extent possible depending on the ability and aptitude of the student and the flexibility of the training facility involved.

MAINTENANCE AND REPAIR
Courses 8542-8543-8544
Section B
September 3, 1974

Performance objectives in each of the areas are set forth below.

Level I - Course No. 8542
In each of the following areas the student will:

Auto Mechanics

1. Use hand tools safely.
2. Adjust ignition points and spark plugs.
3. Service the lubrication system.
4. Service the cooling system.
5. Install shock absorbers.

Welding

1. Strike an arc.
2. Run a bead.
3. Construct simple welding joints.

Small Gasoline Engine Repair

1. Troubleshoot gas engines.
2. Perform tune-ups.
3. Assemble and disassemble small gasoline engines.

Auto Body Repair

1. Use tools safely and properly.
2. Repair small holes with fiberglass, soldering and/or brazing.
3. Repair small dents with body plastic.
4. Prime and paint auto body components.

Metal Working

1. Use metal working hand tools and machinery safely and correctly.
2. Design, produce, and manufacture small metal projects.

Building Trades

1. Identify and use hand tools safely.
2. Identify and use power tools safely.
3. Select, assemble, and join building materials.

Home Maintenance

1. Hang and adjust doors
2. Select and replace electrical fuses.
3. Wire electrical switches.
4. Repair and refinish furniture.
5. Repair small appliances.
6. Select and apply paints.

7. Repair minor plumbing fixtures.
8. Replace window glass and screens.
9. Employ safe work habits.

Levels II and III - Course No. 8543-8544

It is the aim of this program in Level I to guide those students who have developed basic competencies and the necessary interest, into regular specialized trade programs for the second and third years. However, some students are not yet ready to benefit from this transition and may be better served by remaining in the Maintenance and Repair program.

Because of the nature of the program and the built-in flexibility of the curriculum to meet the unique needs of individual students, it is difficult to establish meaningful objectives in advance for these levels. Therefore, performance objectives for students remaining in this program for Levels II and III are determined for each student based upon his/her established need. The primary consideration in these two levels is to develop salable job skills that would make the student employable in his/her area or areas of interest.

TRADE AND INDUSTRIAL EDUCATION
INDUSTRIAL CAREER PREPARATION
PLUMBING

O. E. Code 171007

D. O. T. Classification 862.381

This is a trade-preparatory program designed to develop the related information and practical skills necessary for entering the plumbing trade.

Related Information

The student learns the purpose, function, and installation procedure of the various component parts of the complete plumbing system including all applicable building codes.

Practical Application

The student learns the safe and correct use of the basic trade tools in designing, constructing, installing, and repairing plumbing systems.

COURSES

Course No. 8551 - Plumbing I

Credits:	2
Minimum Class Time:	480 hours
Maximum Students per Class:	20
Prerequisites:	Completion of 9th grade

Course No. 8552 - Plumbing II

Credits:	3
Minimum Class Time	480 hours
Maximum Students per Class:	20
Prerequisites:	Completion of Level I objectives

PROGRAM OBJECTIVES

Student will:

1. Demonstrate the safe and correct use of basic plumbing hand tools.
2. Repair and replace residential plumbing fixture faucets and trim.
3. Cut, ream, and thread steel pipe, using hand tools.
4. Cut cast iron soil pipe, using hammer and chisel.
5. Cut and join plastic drainage piping.

6. Cut, ream, and solder copper tubing.
7. Interpret plumbing symbols on blueprints.
8. Identify fittings used in the drainage system.
9. Identify fittings used in the vent system.
10. Identify fittings used in the domestic water system.
11. Demonstrate a knowledge of math and science related to the plumbing trade.
12. Make simple isometric sketches of piping.
13. Solve problems encountered in the grading of drainage piping.
14. Calculate cutting measurements for drainage pipe fittings.
15. Calculate cutting measurements for steel pipe and threaded fittings.
16. Calculate cutting measurements for copper tubing and solder fittings.

Level II - Course No. - 8552

Student will:

1. Explain the principles of drainage and venting.
2. Read and interpret residential blueprints.
3. Draw a foundation and floor plan of a small residence to scale.
4. Lay out fixtures and related piping in a residential bathroom.
5. Read and explain residential plumbing specifications.
6. Make isometric sketch of residential bathroom piping.
7. Correctly plan the underground drainage piping for a residence.
8. Install a water heater.
9. Install basic residential plumbing fixtures.
10. Interpret the plumbing code.
11. Set up, level, and transfer elevations, with the builders level.
12. Make accurate cost estimates for small piping projects.

13. Rough-in drainage and vent piping for a residential bathroom.

14. Rough-in water piping for a residential bathroom..

15. Operate pipe-threading machines.

16. Operate electric snake.

17. Correctly use closet auger and plunger.

TRADE AND INDUSTRIAL EDUCATION
HEALTH CAREER PREPARATION
PRACTICAL NURSING

O. E. Code 070302 D. O. T. Classification 079.378

The practical nursing program prepares the student for licensure by the state of Virginia as a practical nurse. The two phases of the program are (1) preclinical instruction and (2) clinical instruction.

Preclinical Instruction

Classroom study of basic knowledge and skills necessary for practical nursing.

Clinical Instruction

Patient oriented instruction taking place in the hospital setting. Supervision of skills acquired during preclinical instruction.

COURSES

Course No. 8557 - Preclinical Instruction

Credits:	3
Minimum Class Time:	480 hours
Maximum Students per Class:	35
Prerequisites:	Completion of 11th grade 17 years of age Good health Qualifying score on aptitude test

Course No. 8558 - Clinical Instruction

Minimum Hospital Experience:	1352 hours
Instructor-student ratio:	1-10
Prerequisites:	Achievement of objectives of preclinical instruction High School graduation

PROGRAM OBJECTIVES

Students will be prepared to assume their role as a Licensed Practical Nurse. They will be prepared to provide safe and efficient care for patients within the scope of practical nursing. They will develop the desire for continued personal and professional growth.

Performance objectives for the two phases of the program are set forth below:

PRACTICAL NURSING
Courses 8557-8558
Section B
September 3, 1974

Preclinical Instruction - Course No. 8557

Student will:

1. Safely perform basic hygienic care for patients with minimal supervision.
2. Safely perform complex nursing procedures under direct supervision.
3. Demonstrate an understanding of the basic principles underlying the nursing procedures performed.
4. Demonstrate in the care of the patient an understanding of the major medical, surgical and pediatric disease entities.
5. Demonstrate in the care of the patient an understanding of the obstetrical process and the needs and care of the newborn.
6. List organizations in the community which assist people to maintain and/or regain health.
7. Recite the most common characteristics of people at various age levels as a basis for more understanding and effective nursing care.
8. Demonstrate an understanding of the intricacies of the health field generally and the nursing field specifically in order to assume the role of a practical nursing student.
9. Describe the basic structure and function of the normal human body.
10. Demonstrate an understanding of the principles of normal nutrition.
11. Describe the correct procedure for administering medicines to the patient.
12. Prepare a card file of approximately 200 of the most commonly used drugs.
13. Demonstrate a professional manner and dress appropriately for clinical experience.

Clinical Instruction - Course No. 8558

Student will:

1. Function with self-direction in nursing situations relatively free of complexities.
2. Function with the assistance of the physician and/or the registered nurse in more complex nursing situations.
3. Pass the licensing examination for practical nursing.
4. Realize the value of continued personal and vocational growth.
5. Prepare a resume and seek employment as a practical nurse.
6. Be aware of the legal and professional responsibilities of the Licensed Practical Nurse.

TRADE AND INDUSTRIAL EDUCATION
INDUSTRIAL CAREER PREPARATION
PRINTING

O. E. Code 171900 D. O. T. Classification 651.782

This program will provide the student with minimum level job entry skills in the offset printing and duplicating trades. Training includes job planning and estimating, composition (pre-camera preparation), lithographic photography, stripping, platemaking, press operation, bindery and finishing operations.

COURSES

Course No. 8660 - Printing I

Credits:	3
Minimum Class Time:	480 hours (see footnote 1)
Maximum Students per Class:	See footnote 2
Prerequisites:	Ability to read at the 10th grade level Ability to perform simple arithmetic operations involving addition, subtraction, multiplication, division, fractions, decimals, and percentages; ability to read and interpret rulers and scales. Ability to type at rate of 25 wpm with one error/minute

Course No. 8661 - Printing II

Credits:	3
Minimum Class Time:	480 hours (see footnote 1)
Maximum Students per Class:	See footnote 2
Prerequisities:	Completion of Level I objectives.

(1) In Fairfax County in 1974, and for the foreseeable future because of lab time available, enrollment, and staffing, the printing course of study may best be taught in a format different from the traditional 2-year, 3 hour-per-day format used by many other trade-preparatory programs. Alternative formats are enumerated in Section C.

(2) In conformance with the "Policies and Standards of Quality Relating to the Initiation and Operation of Trade and Industrial Education Programs in Virginia," the number of students per class in the program should be limited to the ratio of "1 student per 200 square feet" of laboratory, darkroom, and classroom space combined; or, "1 student per 170 square feet" of laboratory and darkroom space combined when separate classroom facilities of 30 square feet per student are available.

PRINTING
Courses 8660-8661
Section B
September 3, 1974

PROGRAM OBJECTIVES

The completion of all objectives for Levels I and II will prepare the student well for entry into employment in the offset printing and duplicating field with minimum level job skills in all basic areas of the trade. He/she will be able to function independently with a minimum of technical assistance from others. Those students who do not complete all of the objectives may still qualify for entry into one or more occupational categories within the trade.

Performance objectives for each level of this program are set forth below. These objectives should not be construed to be limiting or limits, however. Perhaps some Level I students will demonstrate adeptness in a particular phase of the course--or in particular subject matter--and the ability to proceed toward the completion of level II objectives; but it is recommended that specialization at Level I be deferred in favor of acquiring a broad base upon which to build. Indeed, specialization to exclude all but one particular phase of the subject matter is not desirable even at Level II. By providing the student with a comprehensive course of study in all areas and aspects of the trade, the teacher is demonstrating the interdependence of the various skills required in the trade and is contributing markedly toward the probability of successful job placement upon graduation.

PERFORMANCE OBJECTIVES - Level I - Course No. 8660

Student will:

1. Recognize and employ safe work habits in the performance of all duties in all phases of graphic arts.

2. Calculate the cost and quantity of materials required to produce a finished printed product.

3. Demonstrate a facility with printers' mathematics by copy-fitting typewritten copy to a given area (words, characters to picas, points).

4. Properly mix and use all common darkroom chemicals (developer, stop bath, fixer, reducer, etc.)

5. Use the process camera to produce an acceptable quality line negative from black to white camera copy which is composed entirely of dots, lines, and areas of a single tone.

6. Use a darkroom contact printing frame to produce duplicate negatives, reversals, or line reproduction proof prints.

7. Demonstrate an understanding of color as seen by the eye and the process camera through the use of the proper filter to produce an acceptable quality line negative from light blue copy on white paper.

8. Strip and opaque the required line negative to produce the

finished flat for a particular job according to job specifications (single negative, one surprint in register, etc.)

9. Make a proof of the completed flat for customer approval, and inspect that proof for correct layout and imposition according to press and job specifications (blueprint, whiteprint, diazo, etc.).

10. Properly expose (according to job requirements), develop and gum an additive or subtractive pre-sensitized plate (3M or similar) and properly store flats after use.

11. Demonstrate through recall an understanding knowledge of the principles of offset printing.

12. Setup and make basic adjustments to the duplicating press (A.B. Dick 350, 360; A-M 1250, 1250W; ATF Chief 15, 17; etc.) to operate correctly according to the type of paper being used (sheet size up to 10" x 14") and the job specifications.

13. Operate cutter to cut paper stock to press requirements and job specifications from a diagram showing dimensions and grain of paper.

14. Setup and operate folding machine to make one or two parallel folds according to job specifications and within acceptable tolerances.

15. Perform basic setup and operation of collator to assemble sheets in proper sequence according to job specifications.

16. Perform basic bindery operations: gather and stitch signatures to complete a job according to specifications; use padding press in the production of jobs that require this process; neatly wrap, count, and package completed jobs for delivery to the cusumer.

17. Demonstrate an ability in job planning and layout and design by producing thumbnail sketches, rough layout, and comprehensive layout (camera-ready copy) of assigned project using composition media available.

18. Demonstrate through recall a conversant knowledge of the major printing processes, their similarities and differences; awareness of the history of photo-offset printing; and knowledge of the diverse trades within the offset printing industry.

19. Set display type to job specifications for assigned projects using adhesive type, transfer type, and/or type produced on a photographic display composition machine (such as A-M headliner).

20. Set body type of simple formats to job specifications for assigned projects using mechanical (impact) cold-type composition (IBM Selectric II typewriter, IBM Selectric Composer, and/or A-M Varityper) machines.

PERFORMANCE OBJECTIVES - Level II - Course No. 8661

Student will:

1. Recognize and employ safe work habits in the performance of all duties in all phases of graphic arts.

2. Select from among all alternatives in each step of production, the best method of producing a quality finished printed product.

3. Calculate and provide a written estimate of the cost to produce a finished printed product considering all variable factors (cost and quantities of required materials, machine capacities, hours required for each step of production, etc.).

4. Use the process camera to produce an acceptable quality line negative from any camera copy which is composed entirely of dots, lines, and areas of a single color or tone using filters as required.

5. Determine correct basic exposure times and f-stops for the process camera when film and/or chemical characteristics are changed.

6. Calibrate and use the Kodak graphic arts exposure computer in the production of halftone negatives.

7. Take density readings of continuous tone copy using a sensitometer and interpret those readings to assist in setting the process camera and peripheral timers and lights.

8. Use the process camera to produce an acceptable quality halftone negative with suitable highlight, mid-tone, and shadow dot structure from continuous tone copy (photograph, charcoal or pastel drawing, water color, etc.).

9. (ADVANCED) Produce a set of acceptable quality duotone negatives with suitable highlight, mid-tone, and shadow dot structure, and correct angular relationship, from continuous tone copy using the process camera.

10. Use a darkroom contact printing frame to produce spreads and chokes as necessary.

11. Demonstrate an understanding of the basic theory of color and visible light as it relates to the electromagnetic spectrum, and demonstrate an understanding of the two color mixing processes: additive color mixing and subtractive color mixing (light and pigment mixing), by (a) use of filters in the process camera, and (b) mixing ink to match a given color sample.

12. Draw master flat layouts on goldenrod paper or mylar sheets according to press requirements and job specifications.

13. Strip and opaque the required line and/or halftone negatives to produce the finished flat(s) for a particular job according to job specifications.

14. Make proofs of completed flats for customer approval, and inspect those proofs for correct layout, register, and imposition according to job specifications and press requirements (blueprint, whiteprint, diazo, etc.).

15. Properly expose (according to job requirements), develop, and gum additive or subtractive pre-sensitized plates (3M or similar) which include halftone and solid areas, and properly store slats after use. (Also may include tight register, and multiple step exposures.)

16. Setup and make basic adjustments to duplicating presses to operate correctly according to the type of paper being used (sheet size up to 11" x 17") and the job specifications with particular attention to register.

17. Setup and make basic adjustments to printing presses to operate correctly according to the type of paper being used (sheet size up to 19" x 25") and the job specifications with particular attention to register, ink coverage, and overall printing quality.

18. Recognize printing press problems and take appropriate action to remedy the situation (if within the scope of training).

19. Recognize the different kinds of printing from samples of each (letterpress, offset, intaglio, screen), and recall the advantages disadvantages and limitations of each printing process.

20. Operate cutter to trim completed jobs properly to the tolerance required by job specifications.

21. Properly mix (where necessary) and use the various chemicals and compounds required for offset press operation.

22. Set body type to job specifications for assigned projects or production jobs (including centering, tabulating, leadering, flush right margins, and run-arounds) using mechanical (impact) cold-type composition machines (IBM Selectric Composer, and/or A-M Varityper)

23. Produce thumbnail sketches, rough layout, and comprehensive layout (camera-ready copy) for assigned projects or production jobs according to job specifications, using composition media available.

TRADE AND INDUSTRIAL EDUCATION
INDUSTRIAL CAREER PREPARATION
TELEVISION SERVICING

O. E. Code 171500

D. O. T. Classification 720.281

This program prepares the student for employment as a field-service and bench-service repairman on radio and television receivers.

COURSES

Course No. 8536 - Radio and Television Servicing I

Credits:	3
Minimum Class Time:	480 hours
Maximum Students per Class:	20
Prerequisites:	Completion of 9th grade

Course No. 8537 - Radio and Television Servicing II

Credits:	3
Minimum Class Time:	480 hours
Maximum Students per Class:	20
Prerequisites:	Completion of course No. 8536 or Pre-Technical Electronics II

PROGRAM OBJECTIVES

Completion of Level I objectives will prepare the student for employment as a supervised field-service repairman on black and white television receivers to include communicating intelligently with the customer and making a presentable appearance.

Completion of Level II objectives will prepare the student for employment as a supervised field-service repairman on color television receivers and supervised bench-service technician on black and white, color television receivers, and AM/FM stereo radio receivers.

Level I - Course No. 8536

A. Block I Objectives
Student will:

1. Correctly read mathematical scales on specific test equipment.

2. Make accurate measurements on simple AC and DC circuits using specicific test equipment.

3. Interpret and evaluate the meaning of measurements made on simple AC and DC circuits.

B. Block II Objectives
Student will:

1. Make accurate measurements on circuits related to AM radio.

2. Interpret the meaning of the measurements made on circuits related to AM radio.

3. Evaluate the meaning of the measurements made on AM radio circuits.

4. Correctly identify AM radio circuits.

C. Block III Objectives
Student will:

1. Make adjustments on a black and white television receiver related to field-service maintenance.

2. Correctly install black and white television receivers in the home.

3. Perform minor repairs on black and white television receivers related to field-service maintenance.

4. Evaluate and correct antenna problems on black and white television receivers in the home.

Level II - Course No. 8537

A. Block IV Objectives
Student will:

1. Correctly identify AM and FM functional block diagrams and state the purposes for each block.

2. Perform correct alignment on AM and FM radio receivers.

3. Perform supervised field-service maintenance on color television receivers to include:

   a. Installation
   b. Adjustments
   c. Antenna - related problems
   d. Correct evaluation of color vs. black and white display problems
   e. Extent of maintenance that can be performed in the home

B. Block V Objectives
Student will:

1. Recognize a malfunctioning AM/FM stereo receiver.

2. Determine the defective stage by prescribed method.

3. Correctly identify the defect within the state.

4. Correctly repair malfunction and perform overall operational evaluation to determine normal operation.

5. Complete the cost-statement related to the repairs made.

C. Block VI Objectives
Student will:

1. Recognize a malfunctioning black and white and color television receiver.

2. Determine the defective stage by prescribed method.

3. Correctly identify the defect within the stage.

4. Correctly repair malfunction and perform overall operational evaluation to determine normal operation.

5. Complete the cost-statement related to the repairs made.

TRADE AND INDUSTRIAL EDUCATION
INDUSTRIAL CAREER PREPARATION
WELDING

O. E. Code 172300

D. O. T. Classification 810.884

This program prepares the student for entry into the welding trade and other related fields depending upon his/her interest and ability.

COURSES

Course No. 8672 - Welding I

Credits:	3
Minimum Class Time:	480 hours
Maximum Students per Class:	20
Prerequisites:	Completion of 8th grade, coordinated

Course No. 8673 - Welding II

Credits:	3
Minimum Class Time:	480 hours
Maximum Students per Class:	20
Prerequisites:	Completion of Level I objectives

PROGRAM OBJECTIVES

Welders are employed in many industries. They may be exmployed in construction, manufacturing, maintenance, or be used as support personnel for other trades, such as auto body, truck repair, machine shop, plumbing, other automotive trades, bakers union, steam fitting, railroad, aircraft, and shipbuilding industries. They have to possess a great deal of skill not only in the art of welding but in jig preparation, identification of metals, blueprint reading, math and fabrication methods.

They must be able to operate sheet metal tools such as shears, brakes, and other related equipment in order to perform their assigned duties. In essence, they must be able to construct, join, and finish pieces of metal to blueprint or perforated members to refurbish a given product.

Performance objectives are set forth below:

The goal of this program is to prepare the student for entry into the specialized welding area of his/her choice.

The following broad aims are established for the program:

1. To develop the students strong points to a level that he/she will be a productive member of the industry.

2. To make student aware of job specialties and areas of related study that will enable him/her to improve self for future advancement in the welding trade.

3. Apply safety in the shop and welding processes.

4. Demonstrate knowledge of the many welding processes and know when and where they are used.

5. Set up necessary equipment and know how to use it.

6. Apply the procedures used in the welding of different types of joints.

7. Demonstrate a knowledge of electronics and be able to select the different types for different welding situations.

8. Classify different types of metals.

9. Select proper welding procedures for different types of metals.

10. Demonstrate and understand some of the problems of labor and management.

11. Develop and understand jigs and fixtures and apply them in his work.

12. Conduct self in a proper manner so that he/she may benefit his/her company and

13. Develop an awareness of opportunities in trades and of where to find the field of his/her choice or ability.

14. Understand the requirements of the trade and what must be done to comply with them.

15. Develop an appreciation for quality and apply it to own work.

16. Be able to communicate with engineers, draftsmen and foremen, and follow their drawings and instructions.

17. Develop the ability to present self to a personnel department and be able to write and keep a resume of accomplishments.

The above aims are met throughout the welding courses and deal mainly with the attitudes necessary for the student to function in the trade area. The objectives listed below are accomplished by individual students at a rate depending upon ability, maturity, and coordination. They are listed in order of difficulty from the simple to the most complex. Their mastery is governed by student ability and indicates the level of entry in the trade. Specific performance objectives for each level are set forth below:

Level I - Course No. 8672

Student will:

1. Operate a grinder
2. Operate air arc gauger
3. Operate drill press
4. Operate nibbler
5. Operate shear
6. Operate band saw
7. Operate iron worker
8. Start and stop an arc
9. Run a series of beads in a pad
10. Run beads in different directions and tie them together
11. Arc weld with 5/32 electrode
12. Arc weld using a weave pass
13. Arc weld 3/16 square butt joint
14. Arc weld lap joint
15. Arc weld tee joint
16. Set up and use cutting torch
17. Arc weld horizontal tee joint
18. Arc weld horizontal vee groove butt joint
19. Use any of the above skills in the fabrication of job assignment

Level II - Course No. 8673

Student will:

1. Arc weld vee groove vertical position
2. Arc weld tee joint vertical position
3. Arc weld vee groove
4. Arc weld tee joint overhead
5. Set up mig welder
6. Run a bead with mig
7. Run a weave pass with mig
8. Weld square butt joint with mig
9. Weld tee joint with mig
10. Oxy-acetylene weld steel four positions
11. Oxy-acetelene weld steel tube
12. Set up TIG machine for alloy steel
13. TIG weld steel and aluminum butt joint
14. TIG weld steel and aluminum tee joint
15. TIG weld steel and aluminum tubing
16. Weld to A. W. S. B-40-41T standards and obtain A. W. S. certification in arc welding process.

TRADE AND INDUSTRIAL EDUCATION
INDUSTRIAL CAREER EXPLORATION
ELECTRICITY/ELECTRONICS TRADES EXPLORATION

O. E. Code 179999

This program is an exploratory study of a broad range of skills and career roles associated with the electrical/electronic and related industries. The primary purpose is to help the student discover his/her interests and aptitudes leading to subsequent career decisions. The fundamental skills and knowledge of electrical/electronic phenomena and apparatus to be gained from this program will also be useful to all consumers of such products.

COURSES

Course No. 8752 - Electricity/Electronics Trade Exploration I

Credits:	1
Minimum Class Time:	160 hours
Maximum Students per Class:	20
Prerequisites:	Completion of eighth grade

Course No. 8754 - Electricity/Electronics Trades Exploration II

Credits:	1
Minimum Class Time:	160 hours
Maximum Students per Class	20
Prerequisites:	Completion of eighth grade plus objectives of Level I

PROGRAM OBJECTIVES

Performance objectives for the program are set forth below:

LEVEL I - COURSE 8752

Student will:

1. Demonstrate an ability to use typical electric and electronic measuring and test equipment correctly and safely.
2. Recognize and utilize the various electrical and electronic components that are used in the industry.
3. Recognize several electronic systems by block diagrams, i.e., AM radio, FM radio, black and white TV, color TV, and the digital computer.
4. List careers in the electrical and electronics fields and generally describe occupational roles of workers in these careers.

5. Discuss sources of consumer information for the purpose of buying quality electric and electronic devices economically.

6. Exercise proper safety techniques while working in an environment that includes electrical and/or electronic equipment and circuits.

7. Explain the basic electrical fundamentals including:

   a. basic electrical circuits
   b. magnetism and electromagnetism
   c. alternating current
   d. reactive circuits and resonance
   e. filter networks

8. Construct circuits normally required in wiring a family dwelling.

9. Construct and analyze electronic circuits utilizing vacuum tubes and solid state devices including amplifier, rectifier, and oscillator circuits.

10. Explain the fundamentals of transmission and reception of radio signals.

11. Perform adjustments on AM radios, black and white television sets, and color television sets.

12. Demonstrate basic troubleshooting techniques on electric and electronic components, circuits, and systems.

13. Recognize several industrial and military systems including:

   a. security controls
   b. medical devices
   c. telementry systems
   d. detection and identification devices

14. Distinguish among types of computers such as digital, analog, or hybrid.

15. Use the necessary materials, tools, and instruments to construct an electrical and/or electronic device.

LEVEL II - COURSE NO. 8754

Student will:

1. Analyze A/C circuits using "complex numbers."
2. Identify and contrast various filter circuits.
3. Differentiate between various types of transformers.
4. Identify and utilize various rectifiers including solid state and tube types.
5. Construct and compare several solid state and tube rectifier circuits used as power supplies, including half-wave, full-wave, bridge, and voltage doubler.
6. Construct and analyze single-ended output solid state and vacuum tube amplifiers.
7. Construct and analyze vacuum tube and transistor oscillators.
8. Explain radio transmission and reception.
9. Describe AM and FM radio operation with functional block diagrams and schematics.
10. Align and troubleshoot AM and FM radios.
11. Describe the operation of black and white and color television receivers using functional block diagrams.
12. Service black and white and color television sets by making simple adjustments and minor repairs.
13. Construct amplifiers using integrated circuits.
14. Construct and analyze circuits utilizing individual components and integrated circuits.
15. Describe computer operation from a functional block diagram.
16. Research an electronic circuit or system; construct this as a project and explain its operation.
17. Describe security-control, telemetry, and medical systems by block diagram.

TRADE AND INDUSTRIAL EDUCATION
INDUSTRIAL CAREER PREPARATION
ORNAMENTAL HORTICULTURE

O. E. Code 010500 D. O. T. Classification 040.081

This program prepares students for employment in ornamental horticulture and related occupations.

COURSES

Course No. - 8034 - Ornamental Horticulture I

Credits:	2
Minimum Class Time:	360 hours
Maximum Students per Class:	20
Prerequisites:	Completion of 8th grade

Course No. - 8035 - Ornamental Horticulture II

Credits:	2
Minimum Class Time:	360 hours
Maximum Students per Class:	20
Prerequisites:	Completion of Level I objectives

OBJECTIVES

Ornamental horticulture involves the growing and maintenance of plant materials and their arrangement in a preconceived plan. It embraces the arrangement of land and construction of garden features to achieve an effect which is aesthetically gratifying.

This course is designed to prepare high school youth for employment in occupations such as:

1. Field and production workers in flower, shrub, plant, and ornamental tree growing establishments.
2. Horticultural workers at parks, playgrounds, golf courses, country clubs, cemeteries, and highway departments.
3. Landscape gardeners and tree service workers.
4. Horticulture equipment repairmen.
5. Retail sales work in flower shopes, garden centers, and nurseries.

Performance objectives are set forth below.

Level I - Course No. - 8034

Students will:

1. Identify the different types of enterprises and jobs included in ornamental horticulture.

2. Become familiar with the ornamental horticulture business in the community.

3. Understand the opportunities available for horticulture employment in different parts of the nation.

4. Develop the vocabulary needed to describe plants.

5. Develop an understanding of the use of scientific names in identifying plants.

6. Understand how the differences in plants can be identified.

7. Develop the ability to produce plants from seeds.

8. Develop the ability to produce plants from cuttings.

9. Develop the ability to produce plants by layerage.

10. Demonstrate an understanding of budding and grafting as methods of plant propogation.

11. Build containers and equipment required for plant propagation.

12. Develop the abilities and skills required to control the environmental factors affecting plant growth

13. Transplant seedlings, pot plants, and plant annuals, perennials, shrubs, and trees in the landscape successfully.

14. Understand and use the necessary practices for high quality plants.

15. Be able to recognize and effectively use soil conditioners.

16. Use soil mulches effectively.

17. Be able to control soil erosion in the landscape.

18. Identify various types of plant growing structures and their equipment and to understand their use.

19. Demonstrate an understanding of terminology - Small Engines.

20. Understand principles of operation of small engines.

21. Disassemble, clean, and reassemble small engines.

22. Be able to determine whether to repair or discard engine.

23. Repair and adjust small engines.

24. Perform preventive maintenance on a small engine.

25. Operate lawn mowers safely and effectively.

26. Operate rotary tillers safely and effectively.

27. Operate garden tractors safely and effectively

Level II - Course No. - 8035 Ornamental Horticulture II

Students will:

1. Develop an understanding of the need for plant pest control (animal, plant, and environmental).

2. Recognize the symptoms of pests affecting horticulture plants.

3. Be able to identify specific plant pests as a basis for initiating control measures.

4. Be able to use proper control measures for pests affecting horticultural plants.

5. Be able to present supplies and services to the customer.

6. Know how to close a sale.

7. Be able to establish a new lawn.

8. Be able to maintain a lawn properly.

9. Be able to repair or renovate poor lawns.

10. Operate soil shredders safely and effectively.

11. Operate aerifiers safely and effectively.

12. Operate sod cutters safely and effectively.

13. Operate pesticide applicators safely and effectively

14. Operate chain saw and other power pruning equipment.

15. Develop the ability to treat plant wounds.

16. Develop the skills and abilities required to support woody plants by guying, staking, and cabling.

17. Be able to safely climb and work in trees.

18. Recognize and avoid poisonous plants in the landscape.

19. Be able to use basic first-aid procedures.

20. Understand the importance of physical fitness and labor-saving techniques in horticulture service work.

21. Be able to mix and use concrete.

22. Effectively select and apply paint using power equipment.

23. Be able to erect fences in the landscape or park.

24. Use bricks, concrete blocks, and stone effectively.

25. Be able to do landscape planning and design.

26. Understand complex problems of human relations found in a business by identifying the problems, analyzing the situations, and formulating possible solutions.

27. Communicate effectively with a prospective employer.