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ABSTRACT

Intended to suggest subject matter content of courses or programs in ornamental horticulture for high school and postsecondary vocational-technical programs, this curriculum guide was prepared by staff members of the Agricultural Education Department at the Pennsylvania State University, and tested in a workshop with vocational agriculture teachers. Contents are: (1) Outlines of Courses in Ornamental Horticulture, (2) Ornamental Horticulture Programs for Grades 10, 11, and 12, (3) Nursery Production, (4) Greenhouse Crop Production, (5) Landscape Contracting, (6) Retail Flower Shop Operation and Management, (7) Turfgrass Maintenance and Establishment, (8) Retail Garden Store Operations, (9) Arboriculture, and (10) Horticultural Mechanics. The content is presented in outline form under each topic, and is applicable to the United States and lower Canada. (GB)

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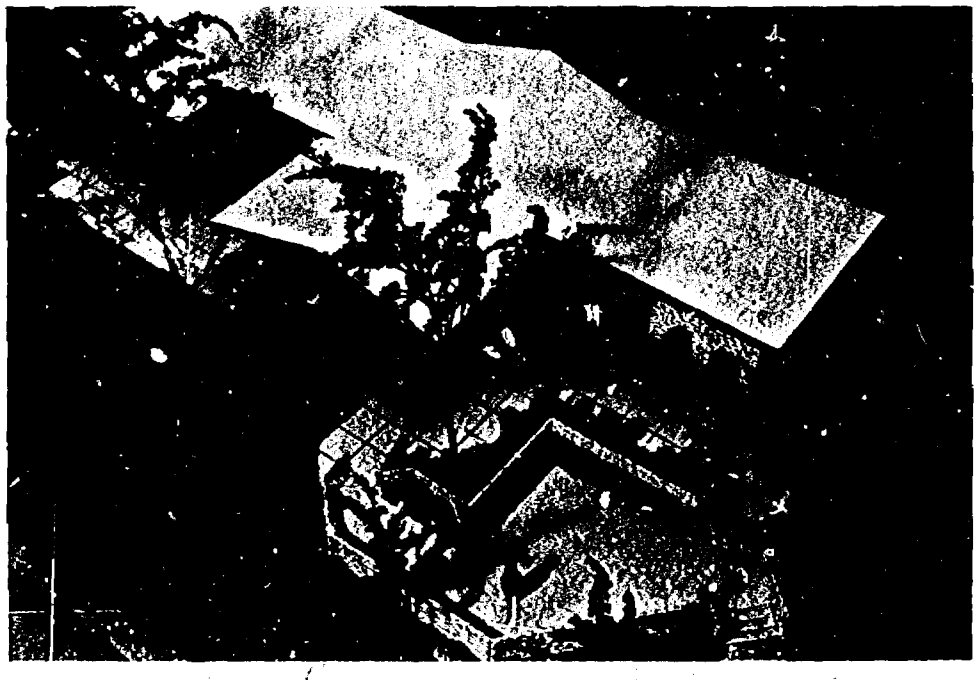
Outlines of Courses in Ornamental Horticulture



The Pennsylvania State University
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Department of Agricultural Education
University Park, Pennsylvania 16802

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PREFACE

The primary purpose of this publication is to suggest subject matter content of courses in ornamental horticulture which might be offered in high school and post-high school vocational-technical programs. A secondary purpose of the publication is to suggest ways in which courses might be organized into programs. Schools having or planning occupational courses in floriculture, nursery or greenhouse production, landscaping, and turfgrass management will find this booklet useful in comparing course content planned or taught with the courses outlined herein.

The research reported herein was performed pursuant to a contract with the Office of Education, U.S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

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Users of Material Vocational Agriculture Teachers, Administrators
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INTRODUCTORY STATEMENT

Outlines of Courses in Ornamental Horticulture, is one of a series of instructional aids being prepared and edited by the Department of Agricultural Education through a contractual agreement between The Pennsylvania State University and the United States Office of Education, Division of Adult and Vocational Research.

This publication was prepared and edited by the following staff members of the Department of Agricultural Education, College of Agriculture, The Pennsylvania State University: Freddie L. Richards, Graduate Assistant; David R. McClay, Professor; and Richard F. Stinson, Associate Professor.

TABLE OF CONTENTS

OUTLINES OF COURSES IN ORNAMENTAL HORTICULTURE

Introduction

In establishing an educational program in ornamental horticulture, the school or institution should consider the employment opportunities in the field both locally and in nearby communities for the youth and adults who complete the program. The majors, options, or courses offered should be those areas of ornamental horticulture in which the greatest opportunities for employment are found.

Educational programs that prepare for occupations in ornamental horticulture will vary in (1) options or courses taught, (2) length, (3) grade level offered, (4) facilities available for teaching, (5) teacher competence, (6) student quality, and (7) enrollment. However, it is hoped this publication will be useful in providing ideas for teachers and others responsible for courses and programs.

For clarity of understanding in this publication, the one or more courses in ornamental horticulture offered in a school are identified here as the school's program in ornamental horticulture. School programs in ornamental horticulture have been growing in increasing numbers in the nation in recent years.

Courses most often span one semester or one year in length. The courses most often found in ornamental horticulture programs are:

1. Nursery Production
2. Greenhouse Production
3. Landscape Contracting
4. Retail Floriculture
5. Turfgrass Maintenance
6. Garden Store Operation
7. Arboriculture

Seldom does a single school program include all seven of the courses listed above. Courses in Garden Store Operation and Arboriculture are found less frequently than the others listed.

School programs that have only one teacher obviously have less flexibility than programs with two or three teachers. Programs usually are offered for grades 11 and 12 in high school, but programs spanning

three grades are common. In some of the larger cities of the nation, ornamental horticulture programs are offered in the elementary and junior high school grades. At the post-high school level in universities, community and junior colleges, and in technical schools, programs are offered which usually span two school years and often lead to an associate degree.

In the types of programs discussed later in this publication, emphasis is given to the vocational or occupational phase of a student's curriculum. A discussion of the "academic" courses which make up an important part of the curriculum is omitted.

Program Organization

The school's ornamental horticulture program might be organized in many ways. Courses could span a semester, one year, or longer. Students in a grade could be taught as a class or combined with another grade or grades depending upon the local situation.

Some examples of frequently found types of program organization for ornamental horticulture follow:

School Program A (Grades 11 and 12)

	Fall Semester	Spring Semester
X	Principles of Plant Growth	Landscape Contracting
Y	Greenhouse Production	Retail Horticulture

A school with one horticulture teacher could offer this program at least two different ways:

(1) Teach program "X" to 11th grade students in the morning each day during the year and teach program "Y" to 12th grade students in the afternoon each day during the year.

(2) Combine both grades and teach program "X" during even years and program "Y" during odd years.

School Program B (Grades 11 and 12)

	Fall Semester	Spring Semester
Even years	Landscape Design	Landscape Establishment and Maintenance
Odd years	Greenhouse Production Nursery Production	

Program B suggests that semester length courses be taught in even years and two different courses, each spanning the full school year, be taught during odd years. The options for teaching the courses listed under school Program A would also apply to Program B.

Schools with greenhouses and ornamental nurseries will need to maintain reasonable production schedules and management practices during the "off years" or during semesters when the courses taught make only very limited use of the greenhouse and nursery facilities.

A school may select the type of program organization shown in School Program C which follows. In this type of organization, portions of subject matter content in ornamental horticulture are taught each year and often each semester. This "cross-section" approach has some advantages over other plans of program organization; however, it usually requires more teacher planning than do other types.

School Program C (Grades 10, 11, 12)

First Year

1st Semester

(1st nine weeks)
Orientation to Agriculture Program
Poinsettia Production
Identification of Deciduous Trees
Turfgrass Establishment
Steam Sterilization
Operation of Equipment and Safety

(2nd nine weeks)
Carnation Production
Plant Propagation
Christmas Decoration
Preparing Materials for Market
Cut Flower Preparation and Care
Cut Mum Production
Supervised Occupational Experience

2nd Semester

(3rd nine weeks)
Rules of Designing
Basic Designs
Bedding Plant Production
Merchandising (Displays)
Small Engine Mechanics
General Greenhouse Culture
Centerpieces

(4th nine weeks)
Bedding Plant Production
Identification of Deciduous Shrubs
Corsage Construction
Garden Center Operation
Planting Landscape Material
Bed Production of Nursery Material
Supervised Occupational Experience

Second Year

1st Semester

(1st nine weeks)
Orientation
Pot Mums
Dried Arrangements
Identification of Evergreen Trees
Tree Maintenance
Nursery Planning and Operation

(2nd nine weeks)
Foliage Plant Production
Lilies
Dish Gardens
Permanent Arrangements
Soil Science (Testing Soil)
Retail Selling
Supervised Occupational Experience

2nd Semester

(3rd nine weeks)
Azaleas
Easter Lilies
Greenhouse Construction
Display with Foliage Plants
Spring Arrangements

(4th nine weeks)
Bedding Plants
Identification of Evergreen Shrubs
Ground Covers
Turfgrass Maintenance
Athletic Fields
Fertilizing Shrubs and Trees
Supervised Occupational Experience

Third Year

1st Semester

(1st nine weeks)
Orientation
Pot Roses
Snapdragons
Pruning and Shearing
Conservation
Personnel Relations

(2nd nine weeks)
Cut Roses
Pest Control in the Greenhouse
Funeral Designs
Recreation (Park Maintenance, etc.)
Landscape Design
Supervised Occupational Experience

2nd Semester

(3rd nine weeks)
Hydrangea Forcing
Wedding Designs
Church Arrangements
Landscape Design Practice
Marketing Horticultural Products

(4th nine weeks)
Bedding Plants
Putting Green and Tee Maintenance
Disease, Insect, Weed Control (shrubs and trees)
Field Liners
Grounds Maintenance
Supervised Occupational Experience

Program C provides time at the beginning of each year for limited orientation of the new students enrolled in the program for the first time. The program should also provide for the organization of a youth club of students enrolled such as the FFA, Horticulture Club, etc.

Schools which have two teachers might offer a program like the one which follows. For illustrative purposes, it is assumed the school's ornamental horticulture facilities include two classrooms, greenhouse, headhouse, horticultural shop, and a land laboratory of several acres which contains a nursery and turf plots. It is also assumed that each student is assigned to ornamental horticulture classes for one-half day each day of the school year. In this example, four options or majors are offered, each spanning one school year. A student enrolled could complete one option per year.

School Program D (Grades 11 and 12)

1st Year - Fall Semester

Teacher	Class	Option and Emphasis
A	a.m. p.m.	Landscape Contracting (Design)
B	a.m. p.m.	Turfgrass Maintenance (Establishment of Turf)

1st Year - Spring Semester

A	a.m. p.m.	Landscape Contracting (Installation)
B	a.m. p.m.	Turfgrass Maintenance (Maintenance of Turf)

2nd Year - Fall Semester

Teacher	Class	Option and Emphasis
A	a.m. p.m.	Retail Floriculture (Design)
B	a.m. p.m.	Nursery Production (Fall and Winter Management and Operation)

2nd Year - Spring Semester

A	a.m. p.m.	Retail Floriculture (Sales and Operation)
B	a.m. p.m.	Nursery Production (Spring and Summer Management and Operation)

School Program D provides for each teacher to have a morning class and an afternoon class in the same option and subject. If both years of Program D were combined, School Program E would be the result.

School Program E (Grades 11 and 12)

Teacher	Semester	Class	Option and Emphasis
A	Fall	a.m.	Landscape Contracting (Design)
	Fall	p.m.	Retail Floriculture (Design)
B	Fall	a.m.	Turfgrass (Establishment)
	Fall	p.m.	Nursery Production (Fall and Winter Management and Operation)
A	Spring	a.m.	Landscape Contracting (Installation)
	Spring	p.m.	Retail Floriculture (Sales and Operation)
B	Spring	a.m.	Turfgrass (Maintenance)
	Spring	p.m.	Nursery Production (Spring and Summer Management and Operation)

ORNAMENTAL HORTICULTURE PROGRAM
FOR GRADES 10, 11, AND 12
COURSE OUTLINES

The suggested course outline presented here is based on three assumptions. These are: (1) that the school offering this program has established a vocational agriculture curriculum for grades 10, 11, and 12; (2) that the program will afford the student an opportunity to select any one of the options or a combination of these options that will fill his needs; and (3) that the weeks of instruction suggested for each area are based on two periods per day, five days per week. Should the periods of instruction offered differ from the assumed 10 period week, adjustment in the course materials would be needed to compensate for the different scheduling.

INTRODUCTION TO ORNAMENTAL HORTICULTURE

GRADE 10

Subject Area	Weeks
A. Program Orientation, Occupational Information, and Leadership Training	12
1. Program Orientation	
2. Occupational Information: Nursery-Landscape, Floriculture Production and Retailing, Turfgrass, Arboriculture, Propagation, Other Specialties	
3. Leadership and Citizenship Training	
4. Supervised Occupational Experience	
B. Plant Science	6
1. Ecology	
2. Taxonomy	
3. Physiology	
C. Soil Science	6
1. Soil Types, Texture, Structure, and Capability	
2. Acidity-Alkalinity	
3. Organic Materials	
4. Soil Microbiology	
5. Soil Testing	
D. Mechanics	12
1. Safe Operation, Use, Basic Maintenance and Storage of Tools and Equipment	
2. Small Gasoline Engines	
3. Reading and Interpretation of Blue Prints, Diagrams, and Schematic Drawings	
Total	36

NURSERY PRODUCTION AND LANDSCAPING OPTION

GRADE 11

Subject Area	Weeks
A. Program Orientation, Occupational Information, Supervised Work Experience, Leadership Training	4
1. Orientation to Program for the Year	
2. Occupational Information	
3. Supervised Work Experience Program	
4. FFA or Ornamental Horticulture Club	
B. Identifying Plant Materials	6
1. Identifying Commonly Used Shrubs and Trees, Ground Covers, and Flowering Plants	
2. Physical Characteristics, Environmental Requirements, and Habits of Growth of Trees, Shrubs, Ground Covers, and Flowering Plants	
C. Propagating Nursery Stock	7
1. Structures, Equipment, and Supplies	
2. Cuttings	
3. Seeds	
4. Grafting	
5. Layering	
6. Cultural Techniques	
D. Growing Nursery Stock	8
1. Lining-Out	
2. Fertilizing	
3. Pruning	
4. Weed Control	
5. Transplanting	
6. Field Culture	
7. Container Growing	
8. Insect and Disease Control in the Nursery	
E. Marketing Nursery Stock	7
1. Digging: Bare-Root, Balled and Burlapped	
2. Storing	
3. Packing	
4. Grading	
5. Shipping and Grading	
F. Mechanics	4
1. Tractor and Equipment Service, Repair, and Operation	
2. Installation and Maintenance of Water Systems	
3. Basic Electricity	
4. Basic Carpentry	
5. Mixing, Placing, and Curing Concrete	
Total	36

GRADE 12

Subject Area	Weeks
A. Program Orientation, Occupational Information, Supervised Work Programs, Leadership Training	2
1. Orientation to Program for the Year	
2. Occupational Information	
3. Supervised Work Experience Program	
4. FFA or Ornamental Horticulture Club	
B. Landscape Design	14
1. Site and Family Needs Analysis	
2. Organization and Layout of Landscape Designs	
3. Symbols and Plant Forms for Design Drawing	
4. Plant and Structural Materials in Landscape Design	
5. Characteristics of Plants (mass, texture, size, and form)	
6. Design and Drawing Practice	
C. Establishing a Landscape	12
1. Construction	
a. Drainage	
b. Grading	
c. Soil amendment	
d. Irrigation systems	
e. Lighting systems	
f. Pavement - drives, walks, terraces	
g. Steps	
h. Dry walls	
i. Fences and screens	
j. Special structures - pools, play equipment, etc.	
2. Planting	
a. Turf - seeding, sodding	
b. Trees - bare root, balled and burlapped	
c. Shrubs	
d. Ground covers	
e. Flowers	
D. Maintaining Landscaped Plantings	8
1. Turf Maintenance	
2. Pruning - Corrective, Hedges	
3. Fertilizing	
4. Using Mulches	
5. Applying Water	
6. Controlling Weeds	
7. Winter Protection	
Total	8

FLORICULTURE OPTION

GRADE 11

Subject Area	Weeks
A. Program Orientation, Occupational Information, Supervised Work Experience, and Leadership Training	4
1. Orientation to Program for the Year	
2. Occupational Information	
3. Supervised Work Experience Programs	
4. FFA or Ornamental Horticulture Club	
B. Soils	4
1. Mediums for Growing Plants	
2. Mixing and Preparing	
3. Testing Greenhouse Soils - Nutrients, pH, Soluble Salts	
C. Fertilizers	3
1. Formula	
2. Mixing	
3. Applying	
4. Storage and Handling	
D. Propagation of Horticulture Plants	10
1. Sturctures, Equipment and Supplies	
2. Seeding	
3. Cuttage	
4. Layering	
5. Dividing	
6. Budding	
7. Grafting	
8. Cultural Techniques	
E. Insect and Disease Control	3
1. Sanitation	
2. Sprays and Dusts	
3. Applying Sprays and Dusts	
4. Fumigation	
F. Managing Production in the Greenhouse	8
1. Watering	
2. Ventilating	
3. Heating	
4. Controlling Diseases and Insects	
5. Storage of Supplies	
6. Organization of Production for a Year	
7. Preparing Products	
G. Mechanics	4
1. Repair and Maintenance of Water Systems	
2. Design and Construction of Frames and Stands	
3. Greenhouse Facility Maintenance and Repair	
4. Repair and Service of Electric Motors	
5. Repair and Maintenance of Heating and Ventilating Systems	
Total	36

GRADE 12

Subject Area	Weeks
A. Program Orientation, Occupational Information Supervised Work Experience Program, and Leadership Training	2
1. Orientation to Program for the Year	
2. Occupational Information	
3. Supervised Work Experience Programs	
4. FFA or Ornamental Horticulture Club	
B. Cut Flower Production	7
1. Cut Flower Industry	
2. Chrysanthemums	
3. Carnations	
4. Snapdragons	
5. Other Crops	
6. Grading and Handling	
C. Production of Pot Plants, Foliage Plants, and Bedding Plants	7
1. Pot Plants	
a. Poinsettias	
b. Pot chrysanthemums	
c. Easter lilies	
2. Foliage Plants	
3. Bedding Plants and Geraniums	

Subject Area	Weeks
D. Arranging Flowers and Plants	8
1. Uses and Characteristics of Flowers, Plants, and Decorative Materials	
2. Designing with Flowers and Decorative Materials	
3. Using Flower Arrangements	
E. Retail Flower Shop Operation and Management	8
1. Merchandising and Selling	
2. Purchasing Flowers and Supplies	
3. Storage of Flowers and Greens	
4. Packaging of Flowers and Plants	
5. Handling and Delivery of Packaged Flowers and Plants	
6. Records and Accounts	
F. Directed Laboratory Work	4
1. Flower Crop Production and Marketing	
2. Floral Design and Retailing	
Total	36

TURF MAINTENANCE OPTION

GRADE 11

Subject Area	Weeks
A. Program Orientation, Occupational Information, and Leadership Training	4
1. Program Orientation	
2. Occupational Information	
3. Supervised Work Experience Programs	
4. FFA or Ornamental Horticulture Club	
B. Identifying Turf Grasses	6
1. Identifying Turf Grasses	
2. Use and Types of Turf	
3. Growth Characteristics	
4. Characteristics of Good Turf	
C. Lawn and Turf Establishment	18
1. Planning: Golf Courses Athletic Fields, Highways, Institutional Turf, Residential Turf	
2. Grading the Site	
3. Drainage Systems	
4. Irrigation Systems	
5. Preparing the Soil	
6. Liming and Fertilizing	
7. Seeding and Seed Mixtures; Laying Sod	
8. Protecting the Seeded Areas	
9. Special Construction; Greens, Bunkers, Traps, Tees, Banks	
10. Cultural Practices for Young Turf	
D. Mechanics	8
1. Repair and Maintenance of Water Systems	
2. Operation, Service, and Repair of Tractors, Mowers, Fertilizer Spreaders, Sprayers, Dusters, and Sweepers	
3. Care and Maintenance of Aerifiers, Vertical Mowers, and Other Renovation Equipment	
Total	36

GRADE 12

Subject Area	Weeks
A. Maintaining Home Lawns	8
1. Fertilizing, Irrigating, Mowing, and Edging	
2. Identification and Control of Lawn Weeds, Diseases, and Insects	
3. Renovating Practices	
B. Maintaining Athletic Fields and Special Turf Areas	8
1. Use Requirements of Athletic Fields and Special Turf Areas	
2. Assessment of Growth and Environmental Conditions	
3. Fertilizing, Mowing, Aerating, and Irrigating	
4. Controlling Pests	
C. Maintaining Golf Courses	12
1. Fertilizing Fairways, Tees, and Greens	
2. Irrigating, Mowing, and Aerating Fairways, Tees, and Greens	
3. Wear Distribution for Tees and Greens	
4. Controlling Pests on Fairways, Tees, and Greens	
5. Maintenance of Trees, Shrubs, and Flowers	
D. Managing a Turf Service Business	8
1. Salesmanship and Customer Relations	
2. Estimating Bids for Custom Work	
3. Purchasing Supplies and Equipment	
4. Handling and Storing Sod, Sprigs, Plugs, and Seeds	
5. Accounts and Records	
Total	36

NURSERY PRODUCTION COURSE

COURSE OUTLINE

A. Kinds of Nurseries

1. The Wholesale Nursery
2. The Retail or Specialist Nursery
3. The Propagation Nursery
4. The Grower-Landscaper Nursery
5. The Nursery Brokerage Firm
6. The Mail Order Nursery

B. Occupations in Nursery Production

1. The Nursery Business as a Career
2. Nursery Production Occupations
   a. Nursery worker
   b. Nursery clerk-typist
   c. Nursery salesman
   d. Stock man
   e. Nursery foreman
   f. Sales manager
   g. Physical plant manager
   h. Storage manager

i. Plant breeder
j. Nursery technician
k. Propagator
l. Nursery production manager
m. Nursery superintendent
n. Nurseryman

3. Nursery Organization
4. Related Occupations
5. Additional Information

C. The Physical Plant

1. Nursery Site Selection
   a. Marketing area
   b. Climatic zone
   c. Topography
   d. Water
   e. Soil
   f. Overhead costs
      (1) Labor
      (2) Utilities
      (3) Fuel
      (4) Taxes
2. Nursery Arrangement, Layout, Provision for Expansion
3. Facilities
   a. Propagation greenhouses
      (1) Propagation benches
      (2) Mist systems
      (3) Grafting cases
   b. Outdoor seedbeds
   c. Coldframes and hotbeds
   d. Lathhouse
   e. Sashhouse
   f. Storage buildings
   g. Office buildings
   h. Irrigation systems
   i. Access roads
4. Equipment
   a. Large equipment
      (1) Tractors, discs, plows, harrows
      (2) Power diggers, root pruners
      (3) Trucks
      (4) Fork lifts
      (5) Tillers
   b. Small equipment
      (1) Soil steamer
      (2) Irrigation systems
         (a) Field
         (b) Greenhouse
      (3) Sprayers and dusters
      (4) Fertilizing equipment
      (5) Hand tools
5. Supplies
   a. Plant materials - seeds, cuttings, etc.

b. Plant containers - pots, flats, etc.
c. Fertilizer
d. Herbicides
e. Soil and soil amendments
f. Insecticides and fungicides
g. Burlap and twine
h. Shipping supplies

D. How Nursery Plants Grow

1. How Stems and Roots Become Longer
2. Functions of Tissues
3. Functions of Organs
4. How Stems and Roots Get Larger
5. How Plants Make the Food They Use
6. How Plants Absorb Water and Nutrients
7. How Plants Lose Water
8. Effect of Environment on Plants and How Nurserymen Adjust the Environment to Grow Good Plants Rapidly

E. Propagation of Nursery Stock

1. Specialized Equipment
2. Vegetative Propagation
   a. Cuttings - softwood, greenwood, hardwood
   b. Grafting
   c. Budding
   d. Layering
   e. Division
3. Seed Propagation
   a. Seed collecting, cleaning, and storing
   b. Greenhouse propagation
   c. Outdoor seedbed propagation
4. Care of Rooted Cuttings and Seedlings

F. Growing Nursery Stock in the Field

1. Crop Rotation Plans
2. Fitting Soil for Planting
3. Plowing, Discing, Smoothing
4. Transplant Beds
5. Lining-Out
6. Transplanting
7. Fertilizing
8. Watering
9. Controlling Pests, Insects, Diseases, Weeds
10. Pruning and Supporting
11. Root Pruning
12. Winter Protection
13. Digging - Bare-Root, and Balled and Burlapped
14. Holding for Short Periods

15. Cold Storage Over Winter
16. Specific Crops
    a. Deciduous shrubs
    b. Narrow leaf evergreens
    c. Broad leaf evergreens
    d. Shade trees
    e. Fruit trees, grapes, etc
    f. Roses
    g. Ground covers
    h. Vines
    i. Perennials
    j. Christmas trees

G. Growing Nursery Stock in Containers

1. Crop Succession Plans
2. Growing Surface
3. Growing Medium
4. Planting
5. Mechanical Planting
6. Setting Out
7. Spacing
8. Watering
9. Fertilizing
10. Pest Control
11. Pruning and Supporting
12. Winter Protection
13. Harvesting
14. Crop Schedules
15. List of Plants Commonly Grown in Containers

H. Marketing

1. Inventory Control
2. Freshly Dug Stock
3. Cold Storage Stock
4. Container-Grown Plants
5. U.S.A. Standard for Nursery Stock.
6. Pricing
7. Labeling
8. Packing
9. Shipping
10. Promotion
11. Quarantine Laws, Federal and State, also Local Ordinances

I. Nursery Calendar of Operations

1. Management Calendar
2. Production Calendar
3. Marketing Calendar

J. Understanding Management

1. What Management Does
   a. Decision making
   b. Functions of management
   c. Successful management
2. Personnel Relations
   a. The employee as a person
   b. The employee on the job
   c. The organization of responsibility
3. Trade Associations and Publications

GREENHOUSE CROP PRODUCTION

COURSE OUTLINE

A. Occupational Opportunities in Greenhouse Crop Production

1. Greenhouse Manager
2. Production Manager
3. Physical Plant Manager
4. Sales Manager
5. Technician
6. Foreman
7. Grower
8. Grower Assistant

B. Greenhouse Location, Structures, and Equipment

1. Purpose of Greenhouse Structures
2. Location of Greenhouse Ranges
3. Parts of a Greenhouse
4. The Greenhouse Range
5. Glazing Materials
   a. Glass
   b. Plastic film
   c. Polyethylene film
   d. Vinyl film
   e. Mylar polyester film
   f. Fiber glass
6. Coldframes

7. Lathhouses
8. Greenhouse Benches and Beds
9. Atmospheric Control
10. Importance of Temperature Control
11. Heating Systems
12. Cooling Systems
13. Ventilation
14. Control of Relative Humidity
15. Carbon Dioxide Enrichment
16. Use of Combinations of Atmospheric Controls
17. Refrigerators
18. Light Intensity and Duration

C. Environmental Control

1. Watering
2. Relationship of Soil and Fertilizer
3. Soil Structure and Texture
4. Artificial Soil Mixtures
   a. Cut flowers
   b. Potted plants
   c. Seeding
   d. Foliage plants
   e. Orchids
5. Fertilizer
6. Pest Control
   a. Importance of pest control
   b. Equipment and methods of control
7. Insect Control
   a. Two-spotted mite or red spider mite
   b. Aphids
   c. Thrips
   d. Greenhouse white fly
8. Disease Control
   a. Damping-off
   b. Powdery mildew
   c. Botrytis
9. Weed Control

D. Potted Plant Production

1. Chrysanthemum
   a. Cultivars
   b. "Week"group
   c. Crop rotations
   d. Photoperiod control
   e. Propagation
   f. Potting
   g. Temperature control
   h. Watering
   i. Fertilizing
   j. Pinching

k. Disbudding
l. Growth regulators
m. Packing and shipping

2. Poinsettia
   a. Cultivars
   b. Propagation
   c. Control of flowering
   d. Potting
   e. Watering
   f. Fertilizing
   g. Temperature control
   h. Pinching
   i. Regulating poinsettia growth
   j. Packing and shipping

3. Easter Lily
   a. Cultivars
   b. Propagation
   c. Bulb size
   d. Precooling
   e. Planting
   f. Fertilizing
   g. Watering
   h. Timing
   i. Straight stems
   j. Height control
   k. Pests
   l. Packing and shipping

4. Bedding Plants
   a. Propagation schedule
   b. Quantities
   c. Mediums
   d. Seed sowing
   e. Moisture
   f. Temperature
   g. Containers
   h. Fertilizing
   i. Transplanting
   j. Purchased seedlings
   k. Culture from transplanting to marketing
   l. Marketing

5. Additional Crops
   a. Geranium
   b. Potted rose
   c. Azalea
   d. Hydrangea
   e. African violet
   f. Foliage plants
   g. Spring flowering bulbs

E. Cut Flower Production

1. Chrysanthemum
   a. Rotations
   b. Bench preparations
   c. Planting
   d. Watering
   e. Fertilizing
   f. Temperature
   g. Carbon dioxide
   h. Pinching
   i. Grading and bunching

2. Carnations
   a. Cultivars
   b. Rotations
   c. Propagation
   d. Soil and fertilizer
   e. Planting
   f. Temperature control
   g. Light intensity control
   h. Photoperiod control
   i. Carbon dioxide
   j. Pinching
   k. Disbudding
   l. Pest control
   m. Diseases
   n. Harvesting the flowers
   o. Grading
   p. Bunching, packing, and storage

3. Snapdragon
   a. Response groups
   b. Propagation
   c. Bench preparation and planting
   d. Temperature control
   e. Watering
   f. Fertilizing
   g. Carbon dioxide
   h. Pest control
   i. Quality control
   j. Harvesting
   k. Grading, bunching, and packing

4. Additional Crops
   a. Roses
   b. Orchids

F. Vegetable Production

1. Tomato
   a. Cultivars
   b. Schedules

c. Soil
d. Propagation
e. Transplanting
f. Fertilizing
g. Watering
h. Temperature control
i. Carbon dioxide
j. Pollination
k. "No smoking"
l. Plant disorders
m. Production in plastic greenhouses
n. Harvesting and marketing

2. Lettuce
a. Cultivars
b. Rotations
c. Soil preparation
d. Temperature
e. Seeding and transplanting
f. Planting
g. Watering
h. Carbon dioxide
i. Harvesting
j. Packing
k. Storage
l. Pest control

LANDSCAPE CONTRACTING

COURSE OUTLINE

PART ONE---LANDSCAPE MAINTENANCE AND ESTABLISHMENT

A. Occupational Opportunities in Landscape Horticulture

1. Landscape Nurseryman
2. Garden Center Manager
3. Grounds Superintendent
4. Park Foreman
5. Nursery Salesman
6. Garden Center Salesman
7. Garden Center Worker
8. Landscape Worker

B. Landscape Maintenance

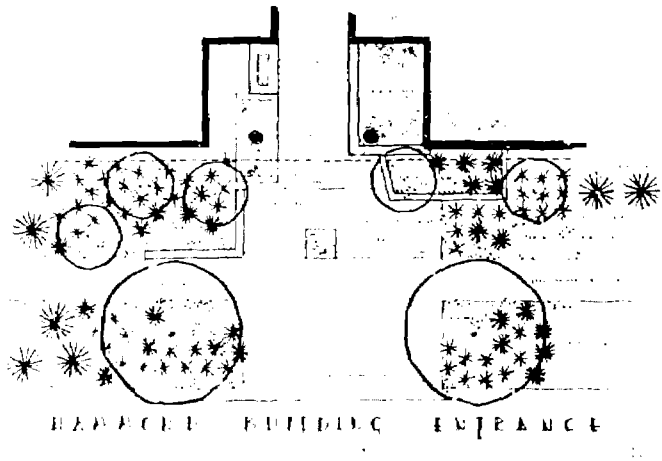
1. Pruning
   a. Injured plants
   b. Rejuvenation
   c. Developing form
   d. Maintaining formal hedges
   e. Pruning shade trees
2. Fertilizing Landscape Plants
   Fertilizing trees, shrubs, ground covers, vines, and lawns

3. Mulching Landscape Plants
4. Watering Landscape Plants
5. Weed Control
6. Insect and Disease Control
7. Safety Checklist for Applying Herbicides and Pesticides
8. Miscellaneous Maintenance
    a. Herbaceous plants
    b. Lawn maintenance
    c. Pools
    d. Winterizing

C. Landscape Establishment

1. Reading the Blueprint
2. Laying Out the Landscape Plan
3. Grading the Site
4. Installing Drainage Systems
5. Constructing Landscape Structures
    a. Drives, walks, and patios
    b. Retaining walls
    c. Free standing walls
    d. Fences
    e. Steps and ramps
    f. Water
6. Soil Modification
7. Buying Nursery Stock
    Grading nursery stock
8. Planting Ornamentals
    a. Transplanting trees
    b. Wrapping and staking
    c. Transplanting shrubs
    d. Planting ground covers
    e. Planting vines and espaliers
    f. Planting herbaceous plants

LANDSCAPE CONTRACTING



COURSE OUTLINE

PART TWO-----LANDSCAPE DESIGN

A. Occupational Opportunities in Landscape Design

1. Landscape Architect
2. Landscape Designer
3. Horticultural Extension Agent
4. Landscape Nurseryman

B. Importance of Landscaping

1. Landscaping for Use
2. Landscaping for Beauty
3. Landscaping Increases Property Value

C. Analysis of Landscape Requirements

1. Site Analysis
   a. On the site factors
      (1) Slopes
      (2) Soil
      (3) Rock outcroppings
      (4) Water
      (5) Existing vegetation
      (6) Structures
      (7) Climate of site
      (8) Utilities
      (9) Legal aspects

b. Off the site factors
(1) Favorable views
(2) Unfavorable views
(3) Pedestrian traffic
(4) Noise
(5) Dust
(6) Bright lights

2. Analysis of Family Needs' Check-off List
a. Entertaining
b. Cooking
c. Games
d. Playing
e. Swimming
f. Gardening
g. Bird watching
h. Pets
i. Laundry
j. Storage

3. Cost

4. Area Layout Plan
a. Public area
b. Private area
c. Service area

D. Ideas for Solving Landscape Problems

1. Layout of the Landscape Areas
2. Ideas for Solving Landscape Problems
3. Landscaping the Public Area
a. Establishing a focal point
b. Grouping trees and shrubs
c. Using texture, color, and contrasts
d. Selecting colors to complement structures
e. Using flower beds
f. Screening
g. Landscaping the sidewalk area
4. Landscaping the Private Area
a. Planning the terrace
b. Screening the private area
c. Placing hedges, shrubs, and walls
d. Planning the planting bed
e. Planning the lawn
5. Landscaping the Service Area
a. Planning the facilities
b. Screening the service area
6. Placing Plant Materials
a. Using specimen plants
b. Grouping plant materials
c. Thinning and underplanting
7. Planning

E. Structures and Plants

1. Planning Landscape Structures
   a. Transport structures
      (1) Walks
      (2) Driveways
      (3) Steps
   b. Retention structures
      (1) Fences and walls
      (2) Pools and fountains
      (3) Miscellaneous structures
2. Structural Materials
   a. Asphalt
   b. Concrete
   c. Brick
   d. Flagstones
   e. Loose aggregates
   f. Wood
   g. Tanbark
   h. Metal fencing
   i. Coping
   j. Garden lighting
3. The Structural Plan
4. The Kinds of Plants
   a. Habitsof growth
   b. Hardiness
   c. Maintenance
   d. Fruit, flower, foliage, and branching characteristics
   e. Evergreen and deciduous plant materials
   f. Trees
   g. Shrubs
   h. Ground covers
   i. Espaliers
   j. Vines
5. The Planting Plan
6. The Selection of Plant Material

F. Estimating Landscape Cost

1. Landscape Design
2. Installation Cost

RETAIL FLOWER SHOP OPERATION AND MANAGEMENT

COURSE OUTLINE

A. Exploring Occupational Opportunities in the Retail Flower Business

1. Professional Teacher of Retail Floriculture
   (Other professional people may be employed in marketing, sales promotion, and advertising)
2. Managerial and Supervisory
   a. Retail flower shop owner
   b. Retail flower shop manager
3. Technical - Floral Designer
4. Service Workers
   a. Salesperson
   b. Office worker
   c. Delivery man

B. Uses and Characteristics of Flowers, Plants, and Decorative Materials

1. Flowering Pot Plants
2. Foliage Pot Plants
3. Foliage for Flower Arrangements
4. Characteristics of Cut Flowers
   a. Rose
   b. Chrysanthemum

c. Carnation
d. Gladiolus
e. Snapdragon
f. Stock
g. Asters
h. Bulb flowers
i. Orchid
j. Gardenia

5. Characteristics of Flowering Pot Plants
   a. Poinsettia
   b. Azalea
   c. Easter lily
   d. Chrysanthemum
   e. Geranium
   f. Hydrangea
   g. African violet
   h. Wax begonia
   i. Gloxinia
   j. Cyclamen
6. Additional Flowering Pot Plants
7. Characteristics Of Foliage Plants
8. Characteristics Of Florist Greens
   a. Uses
   b. Colors
   c. Keeping quality
   d. Season
   e. Prices

C. Designing with Flowers and Decorative Materials

1. Principles of Flower Arrangement
   a. Design
      (1) Line
      (2) Form
      (3) Pattern
      (4) Texture
      (5) Color
      (6) Color harmony
   b. Balance
   c. Rhythm
   d. Scale and proportion
   e. Focal point
   f. Harmony
   g. Accent
   h. Repetition
   i. Unity
2. Holding Devices, Containers, and Supplies
   a. Holding devices
   b. Containers
   c. Florist's supplies
3. Designing Home and Hospital Arrangements
   a. Basic designs
   b. The horizontal design

c. The vertical design
d. The right angle
e. The symmetrical triangle
f. The asymmetrical triangle

4. Wedding Design
   a. The rose corsage
   b. The cattley orchid corsage
   c. The cymbidium orchid corsage
   d. The carnation corsage
   e. The wedding bouquet
   f. The boutonniere
5. Funeral Designs
   a. The funeral basket
   b. The funeral spray
6. Decorating a Flowering Pot Plant
7. Design Ideas

D. Using Flower Arrangements

1. Flowers in the Home
2. Flowers in Business
3. Flowers for Weddings
4. Flowers for Funerals
5. Flowers for Special Dates
6. Flowers for Other Occasions

E. Merchandising and Selling

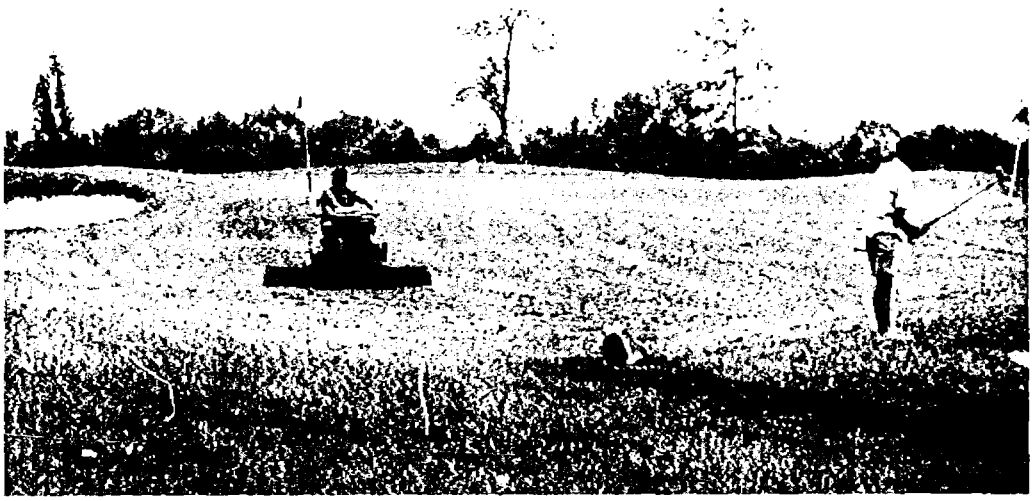
1. Merchandising
   a. Buying
   b. Pricing
      (1) Supply and demand
      (2) Wholesale price
      (3) Total cost
      (4) Prices used by competing florists
      (5) Prices based on volume
   c. Advertising and sales promotion
   d. Advertising budget
   e. Preparing advertising
   f. Other means of merchandising
2. Selling
   a. Greeting the customer
   b. Identifying customer needs and desires
   c. Showing the flowers
   d. Completing the sale
   e. Selling by phone

F. Retail Flower Shop Management

1. Flower Shop Management
2. Locating the Shop
3. Management of Finances
4. Personnel Management
5. Shop Layout

6. Handling Flowers
7. Packaging for Protection and Sales Appeal
8. Packaging Material
9. Delivery Services
10. Record Keeping

TURFGRASS MAINTENANCE AND ESTABLISHMENT



COURSE OUTLINE

A. Exploring Job Opportunities in Turfgrass Businesses

1. Professional
   a. Extension agronomist (turfgrass specialist)
   b. Agronomist
2. Managerial
   a. Golf course superintendent
   b. Athletic field superintendent
   c. Landscape contractor
3. Technical
   a. Assistant golf course superintendent
   b. Turfgrass salesman
4. Service Workers
   a. Greensworker
   b. Landscape gardner
   c. Groundskeeper
   d. Athletic field groundskeeper

B. Kinds of Turfgrasses and Their Use

1. Identifying and Determining the Use of Turfgrasses
2. Vegetative Characteristics of Turfgrasses
   a. Leaf
   b. Bud leaf

c. Stem
d. Bluegrasses
e. Fescues
f. Bentgrasses
g. Ryegrasses
h. Crownvetch
i. Kentucky bluegrass
j. Merion Kentucky bluegrass
k. Rough bluegrass
l. Annual bluegrass
m. Tall fescue
n. Creeping red fescue
o. Chewing fescue
p. Colonial bentgrass
q. Creeping bentgrass
r. Redtop
s. Ryegrass

C. Maintaining Residential and Institutional Lawns

1. Maintaining Soil Fertility
   a. Taking a soil sample
   b. Interpreting soil test recommendations
   c. Lime requirements
   d. General lawn fertility recommendations
   e. Selecting and purchasing fertilizers
   f. Applying fertilizers and lime
2. Mowing the Lawn
   a. Selecting the lawn mower
   b. Mowing height
   c. Frequency of moving
   d. Mowing practices
   e. Clipping
   f. Thatch
   g. Edging and trimming
   h. Aerating the lawn
3. Watering Lawns
   a. Amount and frequency of watering
   b. The time to water
   c. Rate of applying water to the lawn
   d. Equipment used to water the lawn
4. Controlling Lawn Pests
5. Turfgrass Weeds
   a. Annual bluegrass
   b. Buckhorn
   c. Common chickweed
   d. Mouse-eared chickweed
   e. White clover
   f. Crabgrass
   g. Ox-eye daisy
   h. Dandelion
   i. Curly dock

j. Wild garlic species
k. Goosegrass
l. Heal-all
m. Henbit
n. Ground ivy
o. Knot weed
p. Nimblewill
q. Nutgrass
r. Oxalis
s. Blackseed plantain
t. Purslane
u. Quackgrass
v. Sorrel
w. Speedwell
x. Bullthistle
y. Yarrow and yellow rocket

6. Turfgrass Diseases
   a. Leafspot
   b. Rust
   c. Pythium blight
   d. Dollar spot
   e. Fairy ring
   f. Brown patch
   g. Slime molds
   h. Snow molds
   i. Powdery mildew
   j. Nematodes
7. Turfgrass Insects and Suggested Controls
   a. Ants
   b. Grubs
   c. Cinch bugs
   d. Sod webworms
8. Using Pesticides
   a. Safety guides
   b. Guides for maintaining sprayers and dusters
   c. Guides for applying sprays and dusts
   d. Types of sprayers used on lawns

D. Maintaining Athletic Fields and Special Turf Areas

1. Athletic Fields
   a. Cooperation for good turf
   b. Fertility
   c. Mowing
   d. Aeration
   e. Watering
   f. Pest control
   g. Repair
   h. Marking playing fields
2. Special Turfs
   a. Fertility problems
   b. Mowing
   c. Herbicides

E. Maintaining Golf Courses

1. Fertility
   a. Fairway
   b. Tees
   c. Greens
2. Mowing
   a. Roughs
   b. Fairways
   c. Tees
   d. Greens
   e. Clipping
3. Aeration
4. Thatch
5. Watering
   a. Fairways
   b. Tees
   c. Greens
6. Pest Control
7. Wear Distribution

F. Planning and Establishing New Turfgrass Areas

1. Planning New Turfgrass Areas
2. Planning the Grade, Drainage, and Irrigation
   a. Grading
   b. Drainage
   c. Grading and drainage of athletic fields
   d. Drainage of golf tees and greens
   e. Irrigation systems
3. Selecting and Applying Fertilizers
   a. Fertilizer materials
   b. Meeting soil fertility requirements
   c. Liming
   d. Liming materials
   e. Applying lime
   f. Applying basic fertilizer
4. Using Physical Conditioners in Soils
   a. Home lawns
   b. Athletic fields
   c. Golf greens and tees
5. Preparation for Seeding
   a. Applying starter fertilizer
   b. Finish grading
6. Selecting Kinds of Grasses and Grass Mixtures
   a. Regulations governing grass seed sales
   b. Selecting seeding dates
7. Seeding
   a. Covering seed
   b. Rolling
   c. Mulching

8. Vegetative Planting
   a. Sprigging
   b. Sodding
9. Caring for New Grass
10. Renovating Old Turf Areas

RETAIL GARDEN STORE OPERATIONS

COURSE OUTLINE

A. Qualifications and Occupational Opportunities in Retail Garden Store Operations

1. Garden Store Stockman
2. Garden Store Salesman
3. Garden Store Bookkeeper
4. Supervisor
5. Assistant Manager
6. Garden Store Manager
7. Studying Occupations Through Visit to Garden Stores

B. The Marketing System

1. The Business Enterprise System
   a. What it is
   b. Advantages and disadvantages
   c. Types of ownership
   d. Nature and value of competition
   e. Types of partnership
2. Retailing
   a. The local market
   b. Nature and purpose of retailing (product, service, information)

C. Retail Garden Store Facilities and Equipment

1. Location
2. Buildings and Structures
3. Parking
4. Utilities
5. Equipment

D. Identity and Use of Products Sold

1. Plants
   a. Woody plants (trees, shrubs, vines, groundcovers)
   b. Flowering plants, (perennials, bulbs, roses, bedding plants)
   c. Indoor plants
   d. Seeds, (grass, flowers, vegetable)
   e. Cut Christmas trees and greens
2. Supplies
   a. Fertilizers
   b. Pesticides and herbicides
   c. Soil, sand, peat, mulching materials
   d. Fencing, stakes, supports
   e. Containers, tubs, pots
   f. Patio tile, paving stones, etc.
   g. Dried and artificial flowers
   h. Christmas decorations
   i. Bird and pet food
   j. Books, pamphlets
3. Equipment
   a. Garden furniture and decorations
   b. Irrigation equipment
   c. Garden lighting equipment
   d. Lawn mowers
   e. Wheelbarrows, carts, wagons, spreaders
   f. Garden tractors and attachments
   g. Snow removal equipment
   h. Garden tools (spades, rakes, hoes, pruners, etc.)
   i. Pest control equipment, (sprayers, dusters, etc.)

E. Garden Store Services

1. Equipment Repair and Service
2. Landscape Designing
3. Landscape Planting
4. Consulting Service

F. Stocking and Selling

1. Stocking
   a. Seasonal demand and stock control
   b. Labeling and marking
   c. Stock placement and replacement
2. Selling
   a. Approach
   b. Information and suggestions

c. Customer relations
d. Cash handling, receipts, sales records
e. Wrapping and delivery

G. Understanding Management

1. Management Decisions
   a. Policy
   b. Product and stock control
   c. Pricing
   d. Profit planning
   e. Personnel needs
2. Management Functions
   a. Management of capital, products, personnel
   b. Lines of responsibility
3. Personnel Relations
   a. The employee as a person
   b. The employee on the job
   c. Training on the job
   d. Grievances and benefits

H. Garden Store Manpower Needs

1. Employment Needs in Local Area
2. Locating a Job
3. Applying for a Job
4. The Interview
5. Gaining Success as a Garden Store Employee

ARBORICULTURE

COURSE OUTLINE

A. Occupational Opportunities in Arboriculture

1. Importance of Arboriculture
2. Occupational Opportunities
   a. Tree worker
   b. Tree pruner
   c. Tree surgeon
   d. Tree propagator
   e. Tree nurseryman
   f. Tree foreman
   g. Arborist (city forester)

B. How Trees Grow

1. How Stems and Roots Become Longer
2. Functions of Tissues and Organs
3. How Stems and Roots Become Larger
4. How Trees Make the Food They Use
5. How Trees Absorb Water and Nutrients
6. How Trees Lose Water
7. The Effect of Environment on Trees

C. Soil and Tree Growth

1. Soil Composition
2. Soil Structure and Texture

3. Nutrients and pH
4. Soil Temperature, Moisture,and Aeration
5. Soil Improvement for Trees

D. Application of Fertilizer to Trees

1. Importance of Nutrients
2. Materials, Analyses, and Ratios
3. Application Rates
4. Application Methods
   a. Dry formulations
   b. Liquid formulations
   c. Foliar application

E. Selection of Tree Species for Landscape Use

1. General Criteria
   a. Hardiness
   b. Adaptability
   c. Aesthetic appeal
   d. Growth rate and size
   e. Low maintenance
   f. Safety
2. Specific Sites
   a. Street trees
   b. Trees for residences
   c. Trees for institutional and industrial sites
   d. Trees for parks
   e. Trees for highway planting

F. Tree Propagation

1. Structures, Areas, and Equipment
2. Seed Propagation
3. Cutting Propagation
4. Grafting
5. Cultural Techniques

G. Tree Nursery Operations

1. Lining-Out Stock
2. Cultural Techniques
3. Digging and Preparing for Shipment

H. Planting Trees

1. Spacing and Site Preparation
2. Season for Planting
3. Placement and Support
4. Pruning, Wrapping, Watering, Mulching
5. Use of Anti-Transpirants
6. Follow-Up Care

I. Tree Maintenance Equipment

1. Kinds and Their Selection
   a. Tractors, trucks
   b. Pneumatic equipment
   c. Hydraulic equipment
   d. Small engine equipment
   e. Hand tools
2. Safe Operation
3. Maintenance and Adjustment
4. Minor Repairs

J. Tree Climbing

1. Safety
2. Rope Work, Knots, Techniques, Skills
3. Use of Ladders, "Cherry Pickers"

K. Tree Surgery

1. Corrective Pruning
2. Care of Wounds
3. Cavity Work
4. Bracing and Cabling
5. Tree Removal

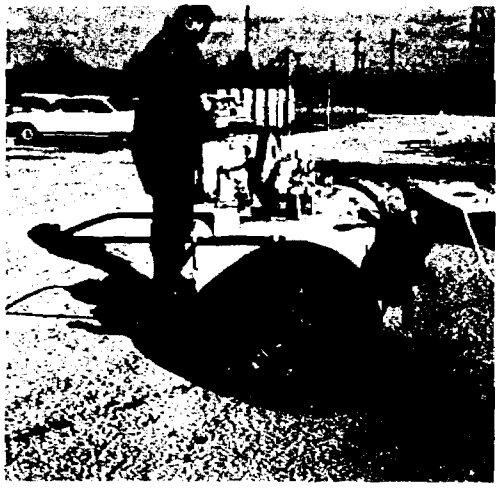
L. Diagnosis and Treatment of Unhealthy Trees

1. Mechanical Injury
2. Nutritional, Moisture, and Soil Aeration Disorders
3. Air Pollution Disorders
4. Disease and Insect Disorders

M. Personnel Relations

1. The Team Concept
2. How Management Thinks
3. Customer Relations

HORTICULTURAL MECHANICS



COURSE OUTLINE

A. Safety

1. Shop Safety Regulations
2. Use of Fire Extinguishers
3. First Aid Demonstration

B. Small Engines

1. Application
2. Repair
3. Maintenance and Storage

C. Agriculture Tractors and Nursery Related Implements

1. Maintenance
2. Repair and Adjustment
3. Safe Use and Driving Instructions
4. Maintaining and Adjusting Power Trains and Drive Systems

D. Trucks, Pick-up Trucks, and Forklifts

1. Maintenance and Minor Repairs
2. Safe Use and Driving Practicum

E. Construction

1. Concrete Construction Including Figuring Quantities

2. Constructing Forms
3. Forming Mixes
4. Placement and Curing
5. Masonry Construction
   a. Brick
   b. Block
   c. Stone layering
6. Carpentry Skills
   a. Figuring bill of materials
   b. Fabrication of wooden buildings
   c. Glues and fasteners

F. Hydraulic Systems and Controls

1. Principles and Theories
2. Application and Uses
3. Safe Use and Practicum in Using Hydraulically Operated Equipment

G. Arc and Gas Welding

1. Operation and Maintenance
2. Skills in Metal Fabrication

H. Plumbing

1. Selection and Use of Copper
2. Selection and Use of Steel
3. Selection and Use of Plastic Pipe
4. Practice in Fabrication of Plumbing Systems

I. Irrigation and Sprinkling

1. Pumps and Pumping Equipment Selection
2. Mathematical Skills in Pumping and Irrigation Problems
3. Selection, Care, and Maintenance of Water Delivering Devices for Greenhouse and Outdoor Irrigation Systems

J. Spraying and Spreading Equipment

1. Care, Repair, and Adjustment of Equipment
2. Safety
3. Application of Dry and Liquid Chemicals

K. Steam Generators

1. Principles of Operation
2. Maintenance
3. Safety and Practical Use

L. Electricity

1. Basic Circuitry and Safety
2. Outdoor Power Supply

M. Mechanically Controlling Artificial Plant Environments

1. Principles of Heating and Cooling
2. Use of Electrical and Mechanical Controlling Systems
3. Operation and Maintenance of CO_2 Generators

N. Tree Tools

1. Operating Skills
2. Sharpening and Storing Chain Saws
3. Care and Safe Use of Tree Climbing Equipment

O. Grass Cutting Equipment

Adjustment, Minor Repair and Maintenance in Using Turf and Lawn Cutting Machines

P. Air Compressors and Pneumatic Powered Equipment

1. Principles and Operation of Air Compressors
2. Operation and Care of Pneumatic Power Equipment