

# SEMESTER -II

13

Sr. No.	Course No.	Course title	Credits
1	H/HORT-122	Plant Propagation and Nursery Management	2+1=3
2	H/HORT-123	Growth and Development of Horticultural Crops	1+1=2
3	H/SSAC-122	Soil Fertility and Nutrient Management	2+1=3
4	H/AGRO-121	Water Management in Horticultural Crops	1+1=2
5	H/BOT-122	Principles of Plant Breeding	1+1=2
6	H/BOT-123	Introductory Plant Physiology	1+1=2
7	H/PATH-121	Fundamentals of Plant Pathology	1+1=2
8	H/ENTO-121	Fundamentals of Entomology	1+1=2
9	H/STAT-121	Elementary Statistics	1+1=2
10	H/EXTN-122	Agricultural Communication and Journalism	0+1=1
		<b>Total</b>	<b>11+10=21</b>
11	H/NSS/NCC-121	National Service Scheme/National Cadet Core	0+1=1(NC)

## SEMESTER II (NEW)

1	H/HORT-122	Plant Propagation and Nursery Management	2+1
2	H/HORT-123	Growth and development of Horticultural Crops.	1+1
3	H/ASSAC-122	Soil Fertility and Nutrition Management	2+1
4	H/AGRO-121	Water Management in Horticultural Crops	1+1
5	H/BOT-122	Principles of Plant Breeding	1+1
6	H/BOT-123	Introductory Plant Physiology	1+1
7	H/PATH-121	Fundamentals of Plant Pathology	1+1
8	H/ENTO-121	Fundamentals of Entomology	1+1
9	H/STAT-121	Elementary Statistics	1+1
10	H/EXTH-122	Agricultural Communication and Journalism	0+1
11	H/NSS-121	National Service Scheme	0+1 NC
		<b>Total credits</b>	<b>11+10=21</b>



### Plant propagation and nursery management

Lesson No.	Topic	Marks
1	Propagation: Definition and potentialities for plant multiplication	10
2 & 3	Sexual and asexual methods of propagation their advantages and disadvantages, different methods for breaking dormancy	10
4 & 5	Seed dormancy internal and external factors affecting seed dormancy different seed treatments.	10
6, 7 & 8	Apomixis, monoembryony, polyembryony, chimera etc.	10
9, 10 & 11	Propagation Structures:- Mist chamber, humidifiers, greenhouses, glasshouses, cold frames, hot beds, poly houses, etc.	10
12 & 13	Use of growth regulators in (seed, vegetables, tissue culture) propagation	10
14 to 20	Methods and techniques of vegetative propagation - cuttings, layering, grafting and budding, Physiological and bio chemical basis of rooting, factors influencing rooting of cuttings and layering, factors affecting grafting, graft incompatibility. Anatomical studies of bud union.	10
21 to 23	Selection and maintenance of mother trees. Collection, storage and transport of scion sticks, scion and root stock relationship.	10
24	Bud wood certification	10
25	Techniques of propagation through specialized organs, such as bulbs, tubers, rhizomes, corms, runners. Suckers, etc.	10
26 & 27	Micropropagation, hardening of plants in nursery.	10
28 to 30	Selection of site for nursery. Features of nursery. Nursery registration act.	10
31 & 32	Plant protection in nursery management.	5



**Plant propagation and nursery management**

**Practical**

<b>Sr. No.</b>	<b>Topics</b>
1	Study of different media for plant propagation
2	Study of different nursery structures
3 & 4	Preparation of raised beds, sowing of seeds and seed germination
5	Raising of seedlings, rootstock in different containers
6	Different seed treatments
7	Preparation of cutting (hardwood, Semihardwood and softwood cutting)
8	Preparation of layers by various methods
9	Preparation of grafts various methods
10	Preparation of budded plants by different methods
11	Preparation and application of plant growth regulators
12	Application of essential plant nutrients in nursery
13	Maintenance of nursery records
14	Application of plant protection measures in nursery
15	Economics of establishment of different nursery structures
16	Visit to commercial nursery and tissue culture laboratory.

**Books:**

1. Principles and practices of Plant propagation: Hartman H.T. and Kester, D.E.
2. Principles of Fruit growing: Kunte and Yawalkar,
3. Propagation of tropical and subtropical fruit crops: T.K.Bose and others.
4. Propagation of tropical fruit trees. ; Garner, R.J. and Chaudhari, S.A.
5. Fruit nursery practices in India: Venkatraman, L.
6. Complete gardening in India : Gopalswamiengar, K.S.



Lecture No.	Topic	Marks
1	Growth and development, definition, components growth, phases in Horticultural crops	5
2	Different stages of growth, growth analysis in Horticultural crops	5
3-5	Plant bioregulators auxin, gibberellin, cytokinin, ethylene, inhibitor and retardants: Basic functions and bio synthesis	5
6	Role of bio regulators in crop growth and development	4
7	Role of bio regulators flowering, fruit setting, fruit thinning, fruit drop, fruit ripening	5
8	Factors affecting flowering, physiology of flowering	4
9	Photoperiodism long day short day and neutral plants, utilization and its application in horticulture	4
10	Developmental processes like juvenility, senescence	4
11	Physiology of seed development and maturation	4
12	Seed dormancy and bud dormancy, causes and dormancy breaking methods in Horticultural crops	4
13	Physiology of fruit growth and development	4
14	Factors affecting fruit set and fruit development	4
15	Physiology of ripening of fruits climacteric and non climacteric fruits	4
16	Sex expression and its relationship	2

**Practical**

1 & 2	Estimation of photosynthetic potential of horticultural crops: Leaf area index, growth analysis parameters including harvest index.
3 & 4	Bioassay of plant hormones, Different methods of estimating bioregulators.
5	Preparation of different bioregulators powder
6	Preparation of different bioregulators lanolin paste
7	Preparation of different bioregulators liquid form
8	Use of bio regulators in rooting of cutting
9	Use of bio regulators in flowering and fruit drop
10	Use of bio regulators in ripening of fruits
11 & 12	Important physiological disorders and their remedial measures in fruit crops
13 & 14	Important physiological disorders and their remedial measures in vegetables
15	Seed dormancy and its breaking by bio regulators
16	Seed Viability test by tetrazolium test

**Books Recommended:**

1. A Carl Leopold: Plant growth and development; Mc Graw Hill publication. New York, Sanfrancisco, Taranto, London.
2. S. Prasad and V. Kumar: Principles of Horticulture; Agro Botanica, 4E 76 IN, Vyas Nagar, Bikaner.



## Teaching Schedule

**Course Title : Soil fertility, fertilizers & nutrient management B. Sc. (Hort.)**

**Course No. : SSAC-121**

**Semester : II**

**Credit : 3 (2+1)**

Lect. No.	Topic
1	Soil as medium for plant growth
2	Soil fertility and productivity, meaning & difference
3-4	Methods of soil fertility evaluation, Visual, chemical and biological methods
5-7	Essential plant nutrients macro & micro nutrients forms, moment, their role and deficiency symptoms and Correction measures.
8	Mechanism of nutrient uptake active & passive
9-10	Problematic soils : Saline, saline-sodic, sodic, acid and calcareous soils their reclamation and management
11	Green manuring types, advantages, disadvantages their method
12-13	Organic manures, sources, biogas slurry, sewage, sludge
14	Agro industrial and urban waste, sewage water
15	Organic manures, composition, role and importance in soil fertility
16	Organic and natural farming
17	Nitrogenous fertilizer, Classification, content and reaction in soil
18-19	Phosphatic & potashic fertilizers, classification Properties their behavior in soil
	MID TERM
20-21	Mixed, Complex and Compound fertilizers
22	Fertigation
23	Slow release fertilizers
24	Biofertilizers, Classification, importance & role
25	Fertilizer management Rain fed & irrigated
26	Fertilizer use efficiency, improvement
27	Handling and storage of fertilizers
28-30	Integrated nutrient management Concept, Component & utility
31-32	Ecofriendly farming & sustainable agriculture
33-35	Soil pollution by agrochemicals



Plant Breeding as dynamic science, genetic basis of Plant Breeding- classical, quantitative and molecular, Plant Breeding in India – limitations major achievements, goal setting for future, Sexual reproduction (cross and self pollination ), asexual reproduction, pollination control mechanism (incompatibility and sterility and implications of reproductive systems on population structure). Genetic components of polygenic variation and breeding strategies, selection as a basis of crop breeding. Hybridization and selection – goals of hybridization, selection of plants; population developed by hybridization- simple crosses, bulk crosses and complex crosses. General and special breeding techniques. Heterosis- concepts, estimation and its genetic basis.

**Practical :** Breeding objectives and techniques in major field crop plants. Floral biology-its measurement, emasculation, crossing and selfing techniques in major crops. Determination of mode of reproduction in crop plants, handling of breeding material and maintenance of experimental records in self and cross pollinated crops. Demonstration of hybrid variation and production techniques.

**Books Recommended :**

1. Singh B.D. (2000) Plant Breeding-Principles and Methods. Kalyani Publishers, New Delhi.
2. Chaudhary, R. C. (1994). Introduction to Plant Breeding. Oxford and IBH publishing Co. Pvt. Ltd. New Delhi.
3. Poehlman, J.M. (1986). Breeding Field Crops, AVL, Publishing company, New Delhi
4. Chaudhary, H.K. (1980) Elementary Principles of plant Breeding, oxford and IBH Publishing.



Water Relation in Plants: role of water in metabolism, osmosis inhibition, diffusion, water potential and its components, measurement of water potential in plants, absorption of water, mechanism of absorption and ascent of sap. Stomata: Structure, distribution, classification, mechanism of opening and closing of stomata. Osmotic pressure, guttation, from bleeding: transpiration methods and mechanism and factors affecting transpiration. Drought: Different types of stresses; water heat and cold tolerance; mechanism of tolerance. Plant Nutrition: Essentiality, mechanism of absorption and its role in plant metabolism. Photosynthesis, structure and function of chloroplast, dark and light reactions, cyclic and non-cyclic electron transfer,  $\text{CO}_2$  fixation –  $\text{C}_3$ ,  $\text{C}_4$  and  $\text{C}_4$  metabolism, Advantages of  $\text{C}_4$  pathway. Photorespiration and its implication, factors affecting photosynthesis. Phytohormones, physiological role in controlling plant process. Environmental stimuli for plant development.

**Practical :** Measurement of water potential, osmosis, root pressure, structure of the stomata, distribution, opening and closing of the stomata, measurement, transpiration and calculation of transpirational pull demonstration. Importance of light and chlorophyll in photosynthesis, pigment identification in horticultural crops and studying the enzyme activity of catalase, estimation of phenols, studying plant movements, root initiation in cuttings.

**Books recommended :**

1. Plant physiology : R. M. Devlin.
2. Plant physiology : Mayer D. S. and B. D. Anuerson (1988).
3. Plant physiology : Pandhe S. N. and B. K. Sinna (1982).
4. The book of plant physiology : Verma V. (1987).
5. Plant propagation practices : Husson T. H. and Dele E. Wester (1987).
1. Plant Physiology : Tez and Ziar.



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**1. Course No. : H/PATH: 121**

**Title: Fundamentals of Plant Pathology**

**Credits : 1+1=2**

**Semester: II**

## **A) Syllabus**

### **Theory:**

Introduction to the science of phytopathology, its objectives, scope and historical background. Classification of plant diseases, symptoms, signs, and related terminology. Parasitic causes of plant diseases (fungi, bacteria, fastidious bacteria, viruses, phytoplasma, protozoa, algae and flowering parasitic plants), their characteristics and classification. Non-parasitic causes of plant diseases. Infection process - host pathogen relationship, avenues of penetration, parasitism. Survival and dispersal of plant pathogens. Plant disease epidemiology, forecasting and disease assessment. Principles and methods of plant disease management. Integrated plant disease management.

### **Practical:**

Familiarity with general plant pathological laboratory and plant protection equipments. Study of disease symptoms and signs and host parasite relationship, avenues of penetration, and parasitism. Identification and isolation of plant pathogens. Koch's postulates. Preparation of fungicidal solutions, slurries, pastes and their applications.

### **Text books Recommended**

1. Introduction to principles of plant pathology by R. S. Singh, Oxford and IBH Publ. Co., New Delhi (1996)
2. Essentials of plant pathology by V. N. Pathak, Prakash Publ., Jaipur (1972)
3. Plant pathology by G. N. Agrios 4th edition, Academ. Press, New york (1997)
4. Introductory Plant Pathology by M. N. Kamat, Prakash Publ, Jaipur (1967)
5. Plant diseases by R. S. Singh
6. Introductory Mycology by Alexopoulos, Mims and Blackwel (2004)
7. Introductory Plant Pathology by H.C. Dube



## B) Teaching (Lecture) Schedule and Weightages

**Course No. : PATH: 121**

Sr. No.	Topic	Lecture No.	Weightages/ Marks
1	Introduction to science of Phytopathology: Its objectives and scope	1	2-2
2	Historical background of Phytopathology	2, 3	3-4
3	Symptoms, Signs and Related Terminology	4	3-4
4	Classification of plant diseases Parasitic causes of plant diseases and their characters Non-parasitic causes of plant diseases	5	3-4
5	Fungi ,their characteristics and classification	6, 7	4-5
6	Bacteria, their characteristics and classification	8	3-4
7	Phytoplasma their characteristics Fastidious bacteria	9	2-3
8	Viruses their characteristics and classification	10	3-5
9	Protozoa, algae and flowering parasitic plants	11	3-4
10	Infection process and avenues of penetration Host-pathogen relationship	12	3-4
11	Survival of plant pathogens	13	2-2
12	Dispersal of plant pathogens	14	2-2
13	Plant disease epidemiology, forecasting and disease assessment,	15	2-2
14	Principles and methods of plant disease management Integrated Plant Disease Management.	16	5-5
	Total	16	40-50

## C) Lesson Plan

**Course No. : PATH: 121**

Sr. No.	Lesson	Lesson No.
1	Introduction to science of Phytopathology : Plant disease concept and Economic Importance, Well known Epiphytotics and losses caused by them Phytopathology, its objectives and scope	1
2	Historical background of Phytopathology: Contributions of: Surpal, Theophrastus, Anton Von, Rober Hook, Leeuwenhoeck, Linnaeus, Prevost, Anton de Bary, Millardet, Louis Pasteur, Robert Koch, Millardet, Burril, E.F.Smith, Mayer, Iwanowaski, Beirink, Stanley, Bawden and Pirrie, Doi et al., Errikson, Stackman, Biffen, Orton, Flor, Van der Plank, Norman Bourlaug, K. C. Mehta, Mundkur, V. P. Bhide and Rangaswami	2, 3
3	Symptoms, Signs and Related Terminology: a) Hypoplastic b) Hyperplastic c) Necrotic Symptoms	4
4	Classification of plant diseases : A) Parasitic causes of plant diseases viz., Fungi, Slime moulds, Bacteria, Phytoplasma, Viruses, Protozoa, Nematodes and Flowering Parasites and their characters, B) Non-parasitic causes of plant diseases	5
5	Fungi and their characteristics: Definition of a typical fungus, Methods of asexual and sexual reproduction in fungi, Asexual and Sexual fruits in fungi, Classification of fungi:	6, 7, 8



6	Bacteria, their characteristics and classification: Major groups of phytopathogenic bacteria	9
7	Phytoplasma, their characteristics, Fastidious bacteria,	9
8	Viruses, their characteristics and classification,	10
9	Protozoa, Algae, Flowering Parasitic Plants: Complete Root and Stem Parasites: Orobanche and Cuscuta sp. Partial Root and Stem Parasites: Striga and Loranthus sp.	11
10	Infection process : Spore germination on host cell, Entry by mechanical pressure, cell wall degradation by enzymes, establishment of parasitic relationship by biotrophs or necrotrophic relationship by necrotrophs, Avenues of Penetration: a) Direct b) Indirect avenues. Host-pathogen relationship: Facultative and obligate parasitism, physiologic specialization,	12
11	Survival of Plant Pathogens: Perpetuation by facultatism, dormant mycelium, sclerotia, Survival on collateral or alternate host (heteroecism) Autoecism, polymorphism	13
12	Dispersal of Plant Pathogens: Continuous dissemination :Autonomous Dissemination through soil, Role of air or wind, water, animals, birds, insects, nematodes and mites B) Discontinuous dissemination: Man, seed, Agril. operations	14
13	Plant Disease Epidemiology: Definition Simple and Compound interest diseases Essential conditions of epiphytotics: i) Host: a) Max.area under susceptible host b) Stage of crop c) Distance from inoculum d) Availabilty of alternate or colateral host ii) Pathogen: a)Aggressiveness or virulency b) High multiplication and death rate c)Easy, rapid, efficient dissemination iii) Environment: Optimum Temperature, R.H., Moisture iv)Time: Synchronus effect of favourable environment, virulent pathogen and suceptible host in given time frame Forecasting: a)Methods, b) Models, c) Satelite Imagery Disease Assessment: a) By Incidence and Severity level b) Disease Rating by grades or points	15
14	Principles and Methods of Plant Disease Management: a) Exclusion: i) Plant Quarantine: Domestic, International, Seed certification, Tuber indexing, PEQ b) Avoidance: By sowing dates, Closed season c) Eradication: Phytosanitation, destruction alternate and colateral host, Rogueing, Different cultural practices, Biocontrol Agents viz., <i>Pseudomonas fluorescense</i> , <i>Trichoderma</i> spp. Physical methods: Heat, Steam, Hot water, Solar Heat d) Protection: By creation of barrier of fungicidal film, Classification of fungicides: Copper, Sulphur: Inorganic e.g. Elemental Organic e.g. Dithiocarbamates: Thiram,	16



	Zineb, Maneb, Mancozeb Systematic: Benzimidazoles: Carbendazim, Acyl alanins: Metalaxyl Trizoles: Propiconazole e) Resistance: Genetic resistance: a) Vertical : Monogenic/Oligogenic b) Horizontal: Polygenic	
15	Integrated Plant Disease Management	16
	Total	16

### D) Exercise schedule (Practical)

Course No. : PATH: 121

Sr. No.	Practical Syllabus	Exercise No.
1	Familiarity with general plant pathological laboratory and plant protection equipments	1, 2
2	Study of typical bread mould fungus	3
2	Study of disease symptoms and signs	4, 5
3	Host parasite relationship. Study of, i) Biotrophs :Obligate parasites ii) Necrotrophs : Obligate saprophytes iii) Facultative saprophytes and iv) Facultative parasites	6
3	Identification & isolation of plant pathogens	7, 8
4	Koch's postulates	9, 10
5	Preparation of fungicidal solutions, slurries, paste & their application viz., i) 1.0 % Bordeaux Mixture ii) 10 % Bordeaux paste iii) 0.2 % Copper oxychloride or 0.2 % Zineb	11 12 13
6	Study of plant protection appliances	14
7	Collection of disease samples and preservation	15, 16
	Total	16



### Teaching Schedule (Theory)

Course No. : H/ENT-121  
 Course Title : Fundamentals of Entomology  
 Credits : 2(1+1)

Lecture No.	Topic
1	Definition, division and scope of entomology, classification of phylum Arthropoda and relationship of class insecta with other classes of Arthropoda.
2	Importance of class insecta- Harmful insects and beneficial insects, dominance of class Insecta.
3	Body segmentation, structure of head, thorax and abdomen.
4	Structure and functions of insect cuticle and moulting.
5	Structure and modification of mouthparts (Chewing and biting, piercing and sucking, chewing and lapping, sponging).
6	Structure and modifications of insect antenna.
7	Structure and modifications of insect leg.
8	Wing venation, modifications and wing coupling apparatus.
9	Sensory organs.
10	Anatomy of digestive system and circulatory system.
11	Anatomy of excretory system.
12	Anatomy of nervous system and endocrine system.
13	Anatomy of male and female reproductive system.
14	Postembryonic development -- eclosion, metamorphosis, its types and diapause in insects.
15	Classification of class insecta upto order. Distinguished characters and economic importance of orders (Lepidoptera, Coleoptera and Hemiptera).
16	Distinguished characters and economic importance of orders (Hymenoptera, Diptera, Neuroptera, Orthoptera and Isoptera).

### Teaching Schedule (Practical)

Lecture No.	Topic
1	Methods of insect collection and preservation.
2	External features of insects.
3	Types of antennae
4	Types of legs.
5	Mouth Parts (Chewing and biting, chewing and lapping)
6	Mouth Parts (Piercing and sucking and sponging)
7	Mouth Parts ( Siphoning and Rasping)
8	Wing venation types of wings and wing coupling apparatus
9	Types of insect eggs, larvae and pupae.
10	Dissection of digestive system -- Cockroach or grasshopper.
11	Dissection of male reproductive system -- Cockroach / grasshopper
12	Dissection of female reproductive system -- Cockroach /grasshopper.
13	Dissection of nervous system- Cockroach / grasshopper.
14	Preparation of permanent mount of insect mouth part and antennae
15	Preparation of permanent mount of insect legs and wings.
16	Studies on types of metamorphosis.



**STAT-121      Statistics      (1+1)**  
**II Semester**

Definition of Statistics, its use, limitations; Frequency Distribution and Frequency Curves; Measures of Central Tendency; Characteristics of Ideal Average, Arithmetic Mean; Median, Mode and their Merits and Demerits; Measures of Dispersion:- Standard Deviation, Variance and Coefficient of Variation; Probability:- Definition and concept of probability; Normal Distribution and its properties; Introduction to Sampling:- Random Sampling; the concept of Standard Error, Tests of Significance – Types of Errors, Types of Hypothesis; Level of Significance and Degrees of Freedom, Steps involved in testing of hypothesis; Large Sample Test – SND test for Means, Single Sample and Two Samples (all type), Small Sample Test for Means, Student's t-test for Single Sample, Two Samples and Paired t-test. F-test; Chi-Square Test in  $2 \times 2$  Contingency Table, Yates' Correction for continuity; Correlation:- Types of Correlation, Scatter Diagram, Computation of Correlation Coefficient 'r' and its testing, Linear Regression: of Y on X and X on Y. Inter-relation between 'r' and regression coefficients. Experimental Designs:- Basic Principles, Completely Randomized Design (CRD), Layout and analysis with equal and unequal number of observations, Randomized Block Design (RBD), Layout and analysis, Latin Square Design (LSD), and analysis.

**Practical:** Frequency Distribution and Frequency Curves; Computation of Arithmetic Mean, Median and mode for Un-Grouped and Grouped data; Computation of Mode for Un-Grouped and Grouped data; Computation of Standard Deviation, Variance and Coefficient of Variation for Un-Grouped and Grouped data; SND test for Means, Single Sample; SND test for Means, Two Sample, Student's t-test for Single Sample; Student's t-test for Two Samples; Paired t-test and F-test; Chi-Square Test in  $2 \times 2$  Contingency Table, Yates' Correction for continuity; Computation of Correlation Coefficient 'r' and its testing; Fitting of regression equations- Y on X and X on Y; Analysis of Completely Randomized Design (CRD); Analysis of Randomized Block Design (RBD); Analysis of Latin Square Design (LSD).



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## H/EXTN-122 Agricultural Communication and Journalism

Credits: 1 (0+1) Semester - II

### PRACTICAL:

Use of TV for communication of information. Preparing script for TV presentation, writing radio talk. Study of Farm advertisements in newspapers, TV and Radio. Writing and evaluation of Extension Literature. Writing and evaluation of news articles. Typing, Printing and proof reading. Presentation and evaluation of radio talk, TV programme. Use of electronic media in Agricultural journalism. Studying reading behaviour of farmers.

### Suggested Readings:

- Samanta, R. K. (1990). Development Communication for Agriculture, BR Publishing Corporation, Delhi.
- Mehata, D. S. (1981). Mass Communication and Journalism in India. Vikas Publication, New Delhi
- Kamat, M. G. (1985). Writing for Farm Families, Allied New Delhi.

## Teaching Schedule

**Course Title : Soil fertility, fertilizers & nutrient management B. Sc. (Hort.)**

**Course No. : SSAC-121**

**Semester : II**

**Credit : 3 (2+1)**

Lect. No.	Topic
1	Soil as medium for plant growth
2	Soil fertility and productivity, meaning & difference
3-4	Methods of soil fertility evaluation, Visual, chemical and biological methods
5-7	Essential plant nutrients macro & micro nutrients forms, moment, their role and deficiency symptoms and Correction measures.
8	Mechanism of nutrient uptake active & passive
9-10	Problematic soils : Saline, saline-sodic, sodic, acid and calcareous soils their reclamation and management
11	Green manuring types, advantages, disadvantages their method
12-13	Organic manures, sources, biogas slurry, sewage, sludge
14	Agro industrial and urban waste, sewage water
15	Organic manures, composion, role and importance in soil fertility
16	Organic and natural farming
17	Nitrogenous fertilizer, Classification, content and reaction in soil
18-19	Phosphatic & potashic fertilizers, classification Properties their behavior in soil
	MID TERM
20-21	Mixed, Complex and Compound fertilizers
22	Fertigation
23	Slow release fertilizers
24	Biofertilizers, Classification, importance & rote
25	Fertilizer management Rain fed & irrigated
26	Fertilizer use efficiency, improvement
27	Handling and storage of fertilizers
28-30	Integrated nutrient management Concept, Component & utility
31-32	Ecofriendly farming & sustainable agriculture
33-35	Soil pollution by agrochemicals



✓ Course No.: H/AGRO – 121 (1+1=2)

Water management in horticultural crops

Credits: 2 (1+1)

Lesson No.	Topic	Marks
1 & 2	Importance of water. Water resources in India. Irrigated area of different crops.	05
3	Functions of water for plant growth	05
4	Effect of moisture stress and excess moisture on crop growth	05
5	Available and unavailable soil moisture, water budgeting	02
6 & 7	Distribution of soil moisture, classification of crops on the basis of rooting depth.	05
8	Water requirement of horticultural crops	05
9	Use of pan evaporation, it's relation to requirement of water for plant growth	02
10	Critical stages of crop growth in respect of irrigation	05
11	Scheduling of irrigation – approach to fruit crops	05
12	Scheduling irrigation to vegetables	05
13 & 14	Methods of irrigation. Pressurized methods – Sprinkler and drip irrigation system.	05
15	Merits and demerits along with suitability of irrigation system.	05
16	Quality of irrigation water – it's role in horticultural crop production	02

**Practical:**

Measurement of irrigation water by using water measurement devices  
Layout for different methods of irrigation  
Estimation of soil moisture constant and soil moisture by using different instruments  
Scheduling of irrigation  
Estimation of irrigation efficiency  
Water requirement of horticultural crops  
Conservation of soil moisture  
Planning of irrigation to horticultural crop  
Practice of land leveling and land shaping implements

**Reference Books**

1. Irrigation: Theory and practice By A.M. Michael
2. Principals of irrigation By Chawala
3. Manual of Drip Irrigation - Karneli



leadership, intellectual ability – potential for development, memory, motivation, objectives, aptitude etc., Group Discussions and Debates on current topics; Review or Feed Back; Praetical examination.

## 2. NSS/NCC / Physical Education

1(0+1)

NSS: Orientation of students in national problems, study of philosophy of NSS, fundamentals rights, directive principles of state policy, socio-economic structure of Indian society, population problems, brief of five year plan. Functional literacy, non-formal education of rural youth, eradication of social evils, awareness programmes, consumer awareness, highlights of consumer act. Environment enrichment and conservation, health, family welfare and nutrition. NCC: Introduction to NCC, defence services, system of NCC training, foot drill, sizing, forming up in three ranks, open and close order march, dressing, getting on parade, dismissing and falling out, saluting, marching, arms drill, shoulder arm, order arm, present arm, guard of honour, ceremonial drill, weapon training – rifle bayonet, light machine gun, steam machine carbine. Introduction and characteristic stripping, assembling and cleaning, loading, unloading and firing. Field craft, visual training, targets, judging distance, fire discipline and fire control orders, battle craft, field signals, description of ground, section formation, section battle drill, scouts and patrols, ambush, field engineering, map reading, conventional signs, grid systems, use of service protractor, prismatic compass and its use, self defence, general principles, precautions and training, attacks and counter attacks, marching and searching, first aid, hygiene and sanitation, civil defence, leadership and NCC song. Physical Education: Introduction to physical education. Posture, exercise for good posture, physical fitness exercises for agility, strength, coordination, endurance and speed. Rules regulations of important games, skill development in any one of the games, football, hockey, cricket, volleyball, badminton, throw ball, tennis. Participation in one of the indoor games, badminton, chess and table tennis. Rules and regulations of athletic events, participation in any one of the athletic events, long jump, high jump, triple jump, javelin throw, discuss throw, shot put, short and long distance running, Safety education, movement education, effective way of doing day-to-day activities. First-aid training, coaching for major games and indoor games. Asans and indigenous ways for physical fitness and curative exercises. Exercises and games for leisure time, use and experience.

Note: Warming up and conditioning exercises are compulsory before the commencement of each class.