1st Semester

M. Sc. (Ag.) Horticulture (Fruit Production & PHT)

S. No.	Course Title	Course Code	Credits
1.	Spices and Plantation Crops	HORT – 701	2 – 0 – 2 = 3
2.	Nursery and orchard Management	HORT – 702	2 – 0 – 2 = 3

Basic Supporting Courses

S. No.	Course Title	Course Code	Credits
3.	Statistics – I	MAS 711	2 – 0 – 2 = 3
4.	Research Methodology	ECON – 705	2 – 0 – 4 = 4
5.	Computer Orientation	COMP – 705	2 – 0 – 2 = 3

2nd Semester

M. Sc. (Ag.) Horticulture (Fruit Production & PHT)

S. No.	Course Title	Course Code	Credits
6.	Propagation of Fruit Crops	HORT - 706	2 – 0 – 2 = 3
7.	Post Harvest Handling and Physiology of Fruits and Vegetable	HORT – 707	2 – 0 – 2 = 3
8.	Post Harvest Technology of Fruits and Vegetable	HORT – 708	2 – 0 – 2 = 3
9.	Plant Growth Regulators in Horticulture	HORT – 709	2 – 0 – 2 = 3
10.	*Temperate and Minor Fruits	HORT – 710	2 – 0 – 2 = 3
11.	*Genetic Resources of Fruit Crops	HORT – 711	2 – 0 – 2 = 3

Basic Supporting Courses

S. No.	Course Title	Course Code	Credits
12.	Statistics – II	BSH - 617	2 – 0 – 2 = 3

- Optional Subjects

3rd Semester

M. Sc. (Ag.) Horticulture (Fruit Production & PHT)

S. No.	Course Title	Course Code	Credits
13.	Taxonomy and Breeding of Horticultural Crops	HORT - 801	3 – 0 – 4 = 5
14.	Tropical and Sub-tropical Fruit Crops	HORT – 802	2 – 0 – 4 = 4
15.	*Fruits and Vegetable Preservation	HORT – 803	2 – 0 – 4 = 4
16.	*Storage And Processing of Fruit Crops	HORT – 804	2 – 0 – 2 = 3
17.	*Role of Plant Growth Regulators in Commercial Production of Fruit Crops	HORT – 805	2 – 0 – 2 = 3
18.	Seminar	HORT – 780	2 – 0 – 2 = 3

4th Semester

M. Sc. (Ag.) Horticulture (Fruit Production & PHT)

S. No.	Course Title	Course Code	Credits
19.	Thesis / Research	HORT - 899	0 – 0 – 130 = 15

Semester 1st

HORT – 701 Spices and Plantation Crops 3(2-0-2)

Spices: Origin, distribution and morphology of spice crops *viz*. tree spice seed spice, herbal spices, ginger, turmeric, onion, garlic, black pepper *etc*. Origin, distribution and morphology of plantation crops HORT – coffee, tea, coconut, areac nut, rubber, cashew nut, cocoa, vanilla, paprilea etc. production and problems of processing and economic utilization and plant protection measures.
Visit to commercial crop production and research centers. Production technology and processing of same important crops like black pepper, cardamom, ginger, turmeric, paprika nutmeg, etc.

Practical

1. Morphological study
2. Nursery technique
3. Planting methods
4. Plant protection measures

HORT – 702 Nursery and orchard management 3(2-0-2)

Present status, problems and scope of nurseries. Planning and layout of orchard. Selection, certification and maintenance of mother plants and Mist chambers, Glass houses & Green houses. Modern propagation structure and bottom heating techniques. Soil mixtures, rooting media, containers and soil sterilization. Lifting, packaging, transportation and marketing of nursery plants.
Economics of raising nurseries and Nursery Act. Importance of orchard management. Impact of various operations like planting, irrigation, drainage, fertilizer application, pruning, soil management practices etc. on growth and productivity of fruit trees. Important records for orchard management, forecast register, DMS, basic information register, log book – I, II, movement order, cash book, produce register.

Practical:

1. Preparation of nursery beds.
2. Use of tetrazolium salts for germination tests.
3. Stratification and scarification of seeds.
4. Handling, lifting and packaging of plants.
5. Training and maintenance of root stock plants.
6. Practicing recent techniques in grafting, budding, layering and cottage.
7. Orchard planting methods.
8. Pruning of fruits trees.
9. Visit to some of the well reputed nurseries & orchards.

MAS – 711 Statistics – I 3(2-0-2)

Statistical Methods: Measures of Skewness and Kurtosis standard error of mean, Coefficient of variation.
Theory of Probability: Definitions, Additions and Multiplication rules of Probability, Conditional probability.
Probability distributions: Normal, Binomial and Poisson distribution.
Correlation and Regression: Simple correlation, Rank correlation, Regression Coefficient, Multiple and Partial Correlation, Regression lines between two variables, Multiple Regression.
Tests of Significance:

X^2 – test
T – Test: one sample two sample t – tests, paired t – test.
Testing of Correlation Coefficient, Standard normal variable test.
F – test:
Fisher's 2 – transformation

Practical:

Coefficient of variation, SE of mean, Skewness and Kurtosis
Fitting of Normal, Binomial and Poisson distribution.
Simple Correlation, Multiple and Partial Correlation with three variables only
Regression lines between two variables
X^2, t and F – tests

ECON – 705 Research Methodology 4(2-0-4)

Theory:

Definition of Science and Scientific research; Classification of research; special features of social science research, Inductive and deductive research; steps involved in scientific investigation; identification of research problem, formulation of hypothesis; Review of literature, sampling procedure, Preparation of schedules and questionnaire, data collection analysis and inferences and reporting of the result.

Practical:

Each student will select a few problems in his area of specialization and one problem will be selected for detailed development in the form of research project including preparation of questionnaire and schedules.

COMP – 705 Computer Orientation 3(2-0-2)

Introduction to multi programming and time sharing computers. Login and creation of files. Introduction of structured programming with reference to BASIC. Variables and constants, complex, double precision, logical, character. Arithmetic expressions, arrays, control statements (DO, IF, Computed, OTO). Functions and subroutines. I/O statements. Elementary programming of algorithms.

Semester 2nd

HORT – 706 Propagation of Fruit Crops 3(2-0-2)

Theory:

Introduction, principles and scope of plant propagation. Methods of plant propagation.Recent advances in propagation of fruit viz. Veneer grafting, epicotyl grafting, stooling and pot layering, bottom heat treatment and bare root transplanting. Anatomical and physiological basis of propagation by cuttings and layering, budding and grafting. Clonal propagation through Apomixis, Chimeras, Bud sport, etc. Propagation by specialized plant parts. Use of growth regulators in plant propagation. Micro – propagation and its importance. Tissue culture in plant propagation, basis of tissue culture techniques and media, and future prospects.

Practical:

Raising of rootstocks. Practicing important methods of plant propagating. Estimation of plant hormones from plant tissue. Application of plant growth regulators – Methods and their dosages. Visit to tissue culture laboratories.

HORT – 707 Post Harvest Handelling & Physiology of Fruits & Veg. 3(2-0-2)

Theory:

Importance and scope of Post Harvest Handling of Fruits and Vegetables.
Nature and structure of fruits and vegetables.
Physiological and bio-chemical changes during maturity, ripening and senescence of fruits.
Physiological disorders of fruits and vegetables. (Chilling, parthenocarpy)
Physiological behaviours of climacteric and non-climacteric fruit during storage.
Impact of physiological processes like respiration, transpiration and C_2H_4 evolution in storage.

Methods of traditional storage, pre-cooling, low – temp. storage, C. A. storage, hypo boric storage and Irradiation/waxing, MA packaging, MCP Technology.

Practical:

Measurement of respiration in fruits and vegetables & marinating indices of fruits.
Maturity indices of fruits.
Determination of chemical constituents like Vit-C, sugar, ascorbic acid.
Use of skin coating/fungicide.
Major post harvest disease of fruits & vegetables.
Importance, scope, causes of post harvest losses, stages of losses, PHT process, post harvest handling system.

HORT – 708 PHT of Fruits & Vegetables 3(2-0-2)

Theory:

History, importance, present status, scope, principles and methods of fruits and vegetable preservation.
Establishment and planning of processing plant.
Causes of spoilage.
Principles and methods of canning and bottling of fruits and vegetables.
Principles and methods of preparation of jams, jellies , marmalade, squashes, cordials, preservatives, candies, crystallized pickles, chutneys, sauces and ketchups.
Fermentation, freezing, drying and dehydration of fruits and vegetables.

Practical:

Experiments on preservation of fruits and vegetables by freezing, canning, dehydration, use of chemical and fermentation.
Preparation of squashes, cordials, preservation, candies, crystallized pickles, chutneys, sauces and ketchups.

HORT – 709 PGR's in Horticulture. 3(2-0-2)

Theory:

History, extraction, bioassay, biosynthesis, structure, role of PGR,s, mode of action, metabolic and morphogenic effect of auxins, gibberellins, cytokinisis, ethylene, growth inhibitors, growth reatdants, morphactins and their applications in horticulture.

Practical:

Bioassay for indigenously produced plant growth substances.
Application of plant growth substances in prevention of fruit drop, sex expression, fruit set, induction of parthenocarpy, fruit thinning, fruit ripening and shelf life of fruits.
Use of growth regulators as herbicides.

HORT – 710 Temperate and Minor Fruits 3(2-0-2)

Theory:

- Origin, botany, distribution and classification of varieties.
- Soil and climatic requirements.
- Rootstock, propagation, planting, training and pruning.
- Manuring, irrigation, weed control, pest and diseases of the plants and various plant protection measures.
- Dormancy, flowering, fruiting, harvesting, storage, marketing and economics of production of major temperate fruits such as apple, pear, peach, plum, apricot, almond, cherry, strawberry, walnut, hazelnut, peanut, chestnut and other minor fruits.

Practical:

- Identification and description of species and cultivars.
- Stock-Scion relationship and study of flowering and fruiting habits.
- Self and cross incompatibility studies.
- Flower and fruit thinning.
- Maturity indices and quality parameters.

HORT – 711 Genetic Resources of Fruit Crops 3(2-0-2)

Theory:

- Role of genetic resources-fruit of origin and diversity of crop plants.
- Law of homologons series – plant introduction and exchange of genetic resources. Principles and concepts of plant quarantine.
- Plant introduction in fruit crops.

- ☞ Germplasm collection and center gene bank, gene sanctuary, need for conservation, genetic erosion, germplasm exploration, germplasm conservation, In-vitro conservation, cryo preservation, DNA finger printing.
- ☞ Wild relations and sources of resistance to biotic, abiotic stress and quality characters for fruit crops.
- ☞ International institutes and organizations for germplasm
- ☞ Trade Related Intellectual Property Rights (TRIPS) and IPR for Indian cultivars.

Practical:

Morphological evaluation of germplasm, collection and identification of wild relatives for fruit crops. One or two visits to the nearest germplasm center are advised.

BSH – 617 Statistics – II (Design of Experiment and analysis of variance) 3(2-0-2)

Analysis of variance: Definition and assumptions, one way classification, two way classification.

Sampling Techniques: Simple random sampling, stratified random sampling, systematic sampling.

Design Experiments : Randomized block design, Latin square design, Factorial design, (2^2, 2^3, 3^2,3 factorials), some p x q factorial experiments, Split Plot Expreiments. Balanced incomplete Block design.

Practical:

Analysis variance, Randomized block design.

Semester 3rd

HORT – 801 Taxonomy and Breeding of Horticultural Crops 5(3-0-4)

- ☞ Different types of classification. Classification of important Horticultural crops.
- ☞ Floral biology of important families. Introduction, history and scope of vegetable breeding.
- ☞ Center of origin and their role in crop improvement. Breeding systems in vegetable crops.
- ☞ Breeding methods in self and cross pollinated vegetables.

- ☞ Inbreeding depressing & heterosis breeding in vegetables.
- ☞ F_1 hybrid seed production. Distant Hybridization.
- ☞ Role of mutation and polyploidy in vegetable improvement.
- ☞ Breeding for disease, insect-pest and nematode resistance.
- ☞ Breeding for tolerance to moisture, heat, cold, salt and air pollution.
- ☞ Breeding for processing and quality. Problems and prospects of fruit breeding in comparison to cereal crops.
- ☞ Different methods of improvement of fruit crop such as introduction, selection, hybridization, polyploidy and mutation breeding.
- ☞ Pollination and incompatibility systems. Specific breeding problems and results achieved in important fruit crops like mango, citrus, grape, banana, strawberry, papaya, pome and stone fruits and floriculture.

Practical:

- ☞ Study of floral biology and pollen viability. Techniques of crossing and selfing.
- ☞ Identification of genetic male sterile and incompatible plants.
- ☞ Demonstration of hybrid vigour. Screening procedure for insect-pest and disease resistance and for tolerance to environmental stress.
- ☞ Methods of inducing mutation and polyploidy.
- ☞ Anthesis, dehiscence and fruit set in different fruit crops, handling of new introductions, exercise on hybridization, polyploidy and mutation breeding techniques and handling of their generations.

HORT – 802 Tropical and Sub-tropical Fruit crops 4(2-0-4)

Theory:

- ☞ Importance, origin, botany, distribution, classification, varieties, soil and climatic requirements.
- ☞ Rootstocks.
- ☞ Propagation and planting, training and pruning, manuring, irrigation, flowering and fruiting, weed control, insect-pests and their control, harvesting, storage and marketing of tropical fruits such as mango, banana, papaya, pineapple, jackfruit, fig, cashew nut, custard apple, mango steen, bread fruit and sub-tropical fruit such as citrus, grapes, guava, litchi, date palm, avocado.

Practical:

- ☞ Identification and description of cultivars.
- ☞ Study of specific propagation methods, flowering and fruiting habits and maturity indices.
- ☞ Preparation of an information sheet for each fruit crop giving details on its agro-techniques.

HORT – 803 Fruits and Vegetable Preservation 4(2-0-4)

Theory:

Importance, present status, scope, principles and methods of fruits and vegetable preservation causes of spoilage, principles and methods of canning an bottling of fruits and vegetables, methods of preparation of jam, jelly, marmalade, squashes, cordial, pickles, chatany,

Practical:

Preparation of Jam, Jelly, marmalade, squash, cordial, pickles, chatany other fruits & vegetable products.

HORT – 804 Storage and Processing of Fruit Crops 3(2-0-2)

Theory:

Mechanical harvesting of fruits. Transport packaging of fruits and vegetable. Processing machinery for fruit and vegetable – peeler, pulper, slicer, mixer, juicer, evaporators/concentrators, coveying and elevating equipment, can/bottle washer and filler, canning machine, bottling machine. Control atmosphere storage and modified atmosphere packaging, vacuum packaging, nitrogen-fill packaging. Draying of vegetables and their products – solar dryer, vacuum dryer, freeze dryer.

Practical:

Study and operation of slicer, juicer, canning machine, bottling machine. Vacuum packaging of fruits and vegetables as well as their products.Solar drying of vegetables. Vacuum drying of fruits and vegetables products. Practices of storage under cold storage, controlled atmosphere conditions, modified storage, ZECC etc.

HORT – 805 Role of PGR's in Commercial Production of fruit Crops 3(2-0-2)

Theory:

Application techniques of growth regulators and their duration, application of plant growth regulators in mango, banana, citrus, grapes, aonla, guava, papaya, strawberry, pineapple, fruits. Inhibit the dormancy. Fruit ripening hormones earliness and off-seasonmango using cultar application, seed treatments in fruit corps, application in PGR's in macro and micro propagation in pre and post harvest studies for cultivars.

Practical:

- ☞ Application techniques of growth regulators and their duration.
- ☞ Seed treatment with growth regulators and chemicals stimulates.
- ☞ Foliar application of plant growth regulator in mango, pine apple, citrus.

HORT – 780 Seminar 3(2-0-2)

4th Semester

HORT – 899 Thesis / Research 15(0-0-130)