

# 1<sup>st</sup> Semester

## M. Sc. (Ag.) Horticulture (Vegetable Science)

S. No.	Course Title	Course Code	Credits
1.	Spices and Plantation Crops	HORT – 701	2 – 0 – 2 = 3
2.	Principles & Technology of Seed Production of Vegetable Crops	HORT – 703	2 – 0 – 2 = 3

### Basic Supporting Courses (Compulsory for all the Branches)

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

# 2<sup>nd</sup> Semester

## M. Sc. (Ag.) Horticulture (Vegetable Science)

S. No.	Course Title	Course Code	Credits
6.	Summer Vegetable Crops	HORT – 712	2 – 0 – 4 = 4
7.	Post Harvest Handling and Physiology of Fruits and Vegetable	HORT – 707	2 – 0 – 2 = 3
8.	Post Harvest Technology of Fruits and Vegetables	HORT – 708	2 – 0 – 2 = 3
9.	Plant Growth Regulators in Horticulture	HORT – 709	2 – 0 – 2 = 3
10.	*Production Technology of Exotic Vegetables	HORT – 713	2 – 0 – 2 = 3

### Basic Supporting Courses (Compulsory for all the Branches)

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

\* Optional Subjects

# 3<sup>rd</sup> Semester

## M. Sc. (Ag.) Horticulture (Vegetable Science)

S. No.	Course Title	Course Code	Credits
12.	Taxonomy and Breeding of Horticultural Crops	HORT - 801	3 – 0 – 4 = 5
13.	Winter and Underutilized Vegetables	HORT - 806	2 – 0 – 2 = 3
14.	*Fruits and Vegetable Preservation	HORT – 803	2 – 0 – 4 = 4
15.	*Seed Production Technology of Vegetable Crops	HORT – 807	2 – 0 – 2 = 3
16.	*Role of Plant Growth Regulators in Commercial Production of Vegetable Crops	HORT – 808	2 – 0 – 2 = 3
17.	Seminar	HORT – 780	2 – 0 – 2 = 3

## 4<sup>th</sup> Semester

## M. Sc. (Ag.) Horticulture (Vegetable Science)

S. No.	Course Title	Course Code	Credits
18.	Thesis / Research	HORT - 899	0 – 0 – 30 = 15

## Semester 1<sup>st</sup>

## ***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 – 703: Principles and Technology of Seed Production of Vegetable Crops 3(2-0-2)***

History, importance and scope of vegetable seed industry in India. Different categories of seeds. Seed production in self and cross pollinated vegetable crops. Factors influencing seed production. Hybrid seed production and maintenance of inbreeds. Seed harvesting, curing, extraction, cleaning, drying, grading and packing. Seed viability. Dormancy and storage requirement. Control of seed borne diseases. Economics of seed production. Seed certification standards. Standardizing field design for maximizing seed yield. Breeder's rights and seed acts.

### **Practical:**

1. Seed viability tests.
2. Demonstration of seed extraction – methods in vegetable crops and also their cleaning, grading and packaging.
3. Methods of breaking seed dormancy.
4. Handling of various equipment and machinery for seed.
5. Visit to seed processing, conditioning and testing labs as well as seed production farms.

## **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.

## **HORT – 712 Summer vegetable Crops**

**4(2-0-4)**

### **Theory:**

Introduction, detailed study of origin history, distribution, areas and production, improved varieties nutritive value, climatic and soil requirements; nursery techniques, sowing/transplanting, nutritional requirements, irrigations, inter-culture, weed control, mulching, plant protection, harvesting, grading, packaging, storage, economics of production and seed production of important summer crops such as squash and gourds, leafy vegetables, sweet potato, yams, etc. Crop problems and solution in culture of these vegetables.

### **Practical:**

- ☞ Preparation of cropping schemes for kitchen garden and commercial farms.
- ☞ Botanical description of important crops.
- ☞ Study of important varieties.
- ☞ Experiments to demonstrate the role of mineral elements, physiological disorders, growth regulators and herbicides.
- ☞ Seed extraction techniques.
- ☞ Identification of important pests and disease and their control measures.
- ☞ Maturity standards and economics of crop production.

## **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<sub>2</sub>H<sub>4</sub> evolution in storage.  
Methods of traditional storage, pre-cooling, low – temp. storage, C. A. storage, hypoboric 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, cytokinins, ethylene, growth inhibitors, growth retardants, 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 – 713      Prod. Technology of Exotic Vegetables***

**3(2-0-2)**

### **Theory:**

Importance and scope of exotic vegetables, its storage, marketing and export potential. Production technology of Broccoli, Brussels sprouts, Asparagus, Baby corn, Chinese cabbage, Celery, Endive, Florence funnel, Garden beet, Globe artichoke, Kale, Leek, Lettuce, Parsley, Parsnip, Red cabbage, Romanesco cauliflower, Rhubarb, Savoy Cabbage, Horse radish etc.

### **Practical:**

Identification of seeds of various exotic vegetables, practice of cultivation of exotic vegetables, cost of cultivation of crops, Numerical on seed, fertilizers and agro-chemicals, nursery management, seed germination percentage, and purity percentage.

## ***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, ( $2^2$ ,  $2^3$ ,  $3^2$ ,  $3^3$  factorials), some  $p \times q$  factorial experiments, Split Plot Experiments. Balanced incomplete Block design.

**Practical:**

Analysis variance, Randomized block design.

## Semester 3<sup>rd</sup>

### ***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 – 806 Winter and Underutilized Vegetable Crops 3(2-0-2)***

### **Theory:**

Introduction and detailed study of origin, history, distribution, area and production, climate and soil requirements. Nursery techniques, sowing/planting. Nutritional requirements, Irrigation, inter-culture, weed control, plant protection, harvesting, grading, packing, storage, economics of production and seed production of important vegetable crops such as cauliflower, cabbage, knol-khol, garden peas, potato, radish, carrot, onion, garlic, turnip, beetroot, palak, lettuce, and underutilized vegetables such as colocasia, basella, coriander, mint, broccoli, kale, brussels sprout, leek, celery, artichoke and asparagus, etc.

### **Practical:**

Preparation of cropping schemes for kitchen garden and commercial farms. Botanical description of important crops. Study of improved varieties of vegetable crops. Experiments to demonstrate the role of mineral elements, growth regulators, herbicides and physiological disorders. Seed extraction techniques. Identification of important pests and diseases and their control measures. Economics of vegetables crop production.

## ***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 and 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 – 807 Seed Production Technology of Vegetable Crops***

**4(2-0-4)**

### **Theory:**

- ☞ History, importance and scope of seed production and seed industry in India
- ☞ Seed production technology encompassing land requirement, isolation requirement, cultural practices, plant protection measures, removal of off types, diseased and insect pest infested plants, harvesting and extraction of seeds) for different categories of seeds viz. breeder seed, foundation seed, certified seed and truthfully labeled seed of O. P. variety for cole crops, solanaceous vegetables, leguminous crops, leafy vegetables, cucurbitaceous vegetables, okra and onion.
- ☞ Hybrid seed production technology for tomato, brinjal, chilli, okra, cucumber, bottle gourd, bitter gourd, sponge gourd, ridge gourd, pumpkin etc.
- ☞ Post harvest management in seed production of vegetable crops including cleaning, drying, screening, grading, packing and storage of seeds.
- ☞ Economics of seed production technology

### **Practical:**

- ☞ Demonstration of various practices in seed production technology of vegetable crops.
- ☞ Handling of various equipments and machinery for seed production
- ☞ Visit of seed processing and storage units

***HORT – 808 Role of Plant Growth Regulators in  
Commercial Production of Vegetable Crops  
3(2-0-2)***

**Theory:**

Application techniques of growth regulators and their duration of application of PGR's in solanaceous vegetables, cucurbitaceous vegetables, cole crops, tuber and root vegetables, leafy vegetables, onion, garlic, potato. Seed treatment in vegetable crops to overcome the seed dormancy, induce the dormancy. Application of PGR's in perennial vegetables, application of PGR's for vegetable nursery.

**Practical:**

- ☞ Application techniques of growth regulators and duration by solution method.
- ☞ Application techniques of grown regulators and duration by:
  - i) Soak treatment
  - ii) Talk treatment
- ☞ Foliar application in vegetable seeds.
- ☞ Micro & macro propagation in tomato, cucurbits using PGR.

***HORT – 780 Seminar***

***3(2-0-2)***

**4<sup>th</sup> Semester**

***HORT – 899 Thesis / Research***

***3(2-0-2)***