

DEPARTMENT OF BOTANY UNIVERSITY OF KASHMIR, SRINAGAR

The new course structure for Horticulture to be adopted for B. Sc. 1st and 2nd Semester from the academic session 2015 and subsequently for B. Sc. 3rd and 4th Semester from the academic session 2016 and B. Sc. 5th and 6th Semester 2017 at Govt. Degree College, Shopian as a new Course with following possible subject combinations:

- i. English, Botany, Zoology and Horticulture
Or
- ii. English, Botany, Chemistry and Horticulture
Or
- iii. English, Chemistry, Zoology and Horticulture

Course Structure: The course will comprise of 6 papers, one paper in each semester to be named as Hort-01 to Hort-06. Each paper will be of 100 marks, 20 for internal assessment and 80 for external examination. For each semester there will be one practical course to be named as L-01 to L-06 worth 50 marks, out of which 25 will be for internal assessment and 25 for external examination. Students will have to submit their practical note books as well as a plant collection herbarium at the time of practical examination..

Field Trips: To make on-field observations and impart on-site training in the subject Horticulture, the colleges will ensure that a minimum of one field trip is organized for each class during the academic session to acquaint the students with the flora of the region and also to collect and prepare 10 Horticulture crop specimens following standard herbarium techniques. The students will, however, avoid collection of rare and threatened plant species.

The revised curriculum is to be adopted for B. Sc 1st Semester from academic session 2015

- i. The question paper shall be of 2 1/2hrs duration
- ii. Each subject shall have internal as well as external components of examination.

Internal Examination at College Level

This test shall be called as Internal Assessment Test, it shall consist of two components:

- a. **Attendance**
- b. **Mid term test/assignment/project work**

The distribution of marks per semester is reflected in the table as under:

Theory (External)	80
Attendance (Internal)	5 marks: wherein distribution will be as 2 mark (75-80%) 3 marks (80-90%) 5 marks (90-100%)
Theory (Mid term test/ project work/assignment- Internal)	15 marks
Total (Internal Assessment)	5+15=20
G. Total (Internal+ External)	100

- i. Number of units to be covered under Internal Assessment Test shall be left to college concerned.
- ii. Composition of marks among three components of part (b) i.e. midterm examination/project work/assignment shall be decided by the college.
- iii. Student must have a minimum 75% of attendance in each semester.
- iv. Student has to secure minimum of 36% percent marks in midterm test/project work/assignment. If college offers all the three, the 36% pass percentage in each component shall be applicable.

External Examination

- i. For external examination the syllabus of each course will be divided into four equal units.
- ii. Examination will be conducted by the Controller of Examinations, University of Kashmir at the end of each semester
- iii. There will be two types of questions in the question paper i.e. medium and long answer type questions comprising of Section A and Section B, respectively
- iv. In Section “A” there will be four medium type questions, one question with internal choice from each unit. All the four questions will be compulsory.
- v. There will be four long answer type questions in Section “B”, one from each unit and the student will be required to attempt any two questions.
- vi. The distribution of marks is reflected in the table as under:-

Theory paper carrying 75 marks
<p>Section A 4 medium answer type questions each carrying 12 marks (4x12) =48</p> <p>Section B 2 long answer type questions each carrying 16 marks (2x16) =32</p> <p style="text-align: center;"><u>Theory component</u></p> <p>Internal examination = 20 marks; Minimum pass marks=8 External examination = 80 marks; Minimum pass marks=32 Total (20+80) =100 marks</p> <p style="text-align: center;"><u>Practical Component</u></p> <p>Internal Assessment: 25 marks; Minimum pass marks = 9 External Examination: 25 marks; Minimum pass marks = 9</p>

- vi. Pass percentage shall remain unchanged i.e 36% for both internal and external examinations.
- vi. Re-evaluation scheme as provided under the existing statute shall ' remain unchanged. Eligibility shall be determined on the basis of 75 marks and 100 marks in case of theory paper carrying an aggregate 100 marks and 150

marks respectively. Internal Assessment shall not be subject to any re-evaluation.

The single paper in no way shall affect the present eligibility norms for promotion to the next class.

Private candidates

Private candidates shall be subject to same external examination pattern as is applicable to the candidates in regular mode. In the case of regular candidates the internal assessment marks shall be added with the marks secured in the external examination. Since, there won't be any internal assessment for the private candidates the marks of the candidates will be raised strictly in proportion to the percentage of marks obtained in the external examination.

Hort-01 (B. Sc. 1st Semester)

Unit: I

- Scope and importance of horticulture with special reference to J&K.
- Classification of horticultural crops, horticultural zones of India.
- Origin of important temperate fruits grown in Kashmir.
- Area, production and productivity of rosaceous fruits in J&K.

Unit: II

- Soil fertility and factors affecting fertility, essential micro- and macro- elements for maintaining soil fertility in fruit crops.
- Evaluation of nutrient status of soils in orchards.
- Deficiency symptoms of essential micro- and macro- elements in fruit crops

Unit: III

- Orchard layout and its types – square, rectangle, quincunx, hexagonal, fencing of orchards.
- Preparation of soil for raising horticulture crops.
- Spacing in orchard management (row to row and plant to plant) – advantages and limitations.
- Planting techniques – traditional and high density planting, precautions during plantation of fruit crops.

Unit: IV

- Nursery techniques and production of healthy planting materials in temperate fruit crops.
- Rejuvenation of old and senile orchards- factors influencing fruitfulness.
- Effect of non-fruit trees in and around the orchard.

Laboratory Exercises: L-01

- Study of various planning and layout of an orchard.
- Study of the morphological symptoms of mineral deficiency in horticultural crops.
- Field visit for fruit and leaf collection.
- Collection of soil sample from an orchard and its nutrient evaluation.
- Digging of pits for fruit plants
- Estimation of soil moisture content, soil pH and soil fertility

Hort-02 (B. Sc. 2nd Semester)

Unit: I

- Classification of soils with respect to texture, Soil profiles.
- Physical and chemical properties of soil in horticultural crops
- Role of soil pH in temperate fruit production.
- Role of microbes in maintaining soil fertility in horticultural crops.

Unit: II

- Types of fertilizers and their applications in horticultural crops.
- Concept of biofertilizers and their utility.
- Types of organic manures and their applications in horticultural crops, Vermicomposting and green manuring.
- Organic fruit production – prospects and limitations

Unit: III

- Irrigation practices of fruit orchards, conventional and modern methods.
- Importance of irrigation at critical stages of fruit crops.
- Harvesting and management of water for irrigation.

Unit: IV

- Role of plant growth regulators in fruit setting and ripening.

- Factors affecting fruit set and fruit production (light and temperature).
- Role of chilling in flowering and fruit set, chilling units for various fruits crops.

Laboratory Exercises: L-02

- Preparation of fertilizer mixtures & methods of application.
- Training and pruning of orchard trees, canopy management.
- Handling and training of various tools used in digging, cutting, pruning, harvesting and storage.
- Determination of soil fertility and soil moisture content through standard techniques.
- Practical demonstration on drip and sprinkle irrigation.

Hort-03 (B. Sc. 3rd Semester)

Unit: I

- Propagation of fruit crops – concept of scion and rootstock, stock-scion relationships and its significance.
- Rootstock types – types and utility of seedling and clonal rootstocks.
- Methods of generating clonal rootstock (cuttings, stooling and layering)
- Techniques of scion and bud grafting for propagation of cultivars.

Unit: II

- Bearing habit of fruits trees – Central ladder system, open centre system, advanced systems, alternate bearing and its implications.
- Concept, principles and methods of pruning and thinning in fruit crops – advantages and disadvantages.
- Management of tree canopy and aeration.
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Unit: III

- Flowering phenology in various rosaceous fruits.
- Self and cross pollination, self incompatibility in fruit crops.
- Pollination, pollinators and pollinizers in fruit crops.
- Pollination and pollinizer management in fruit crops, importance of bee keeping for increasing fruit production,

Unit: IV

- Fruit characteristics with special reference to apple, pear, almond, cherry and walnut.
- Important fruit quality traits affecting marketability with special reference to apple.
- Fruit fall – early, mid and late fruit fall – causes an concerns.

Laboratory Exercises: L-03

- Field visit to study various methods of asexual propagation of a fruit plant.
- Study of characteristics of fruit with special reference to apple, pear, walnut, identification of different varieties based on fruit.
- Study the T-budding , wedge grafting on Apple/ Cherry plant.
- Field study of bearing habit of fruit crops
- Filed visit on understanding of pruning and thinning in fruit crops
- Grafting techniques – scion grafting and bud grafting – practical demonstration.

Hort-04 (B. Sc. 4th Semester)

Unit: I

- Methods of picking, grading, packaging and transportation in fruit crops with special reference to apple, cherry and walnut.
- Principles of fruit preservation, management of C-grade and culled fruit
- Nutritive value and health benefits of important temperate fruit crops
- Processing and value addition in fruit crops with special reference to apple, almond, walnut.

Unit: II

- Climacteric and non-climacteric fruits.
- Post harvest storage in fruit crops – techniques, advantages and disadvantages.
- Importance of post harvest technology in horticultural crops, maturity indices, pre-harvest factors affecting fruit quality.
- Concept and applications of cold storage and controlled atmosphere storage.

Unit: III

- Major diseases of fruit crops and their symptoms

- Control of diseases (Apple Scab, sanjos scale, powdery Mildew, Root and Collar rot, Blight and Dieback).
- Spraying techniques and spraying schedule in horticulture crops.

Unit: IV

- Control of various diseases quarantine, weed eradication, cultural methods, destroying alternate hosts, sanitation, drainage and soil amendments,
- Biological control of various diseases, concept and utility of bio-pesticides.
- Weed management in horticultural crops, herbicide control – advantages and limitations

Laboratory Exercises: L-04

1. Collection of leaf and fruit samples for analysis of various diseases and disease symptoms
2. Practical demonstration on pesticide spraying in an orchard
3. Practical demonstration on picking, grading and packaging in apple fruit
4. Field visits of nearby orchards to identify and study damages caused by scab, Sanjos Scale, Aphids, Mites, Stem borers in apple.
5. Study the preparation of a spray solution of a given concentration and its application, precautions.
6. Field/factory visits of fruit processing and cold storage units.

Hort-05 (B. Sc. 5th Semester)

Unit: I

- Classification and importance of vegetable crops, scope of vegetable cultivation in J&K
- Area, production and productivity in major vegetables of Kashmir.
- Small scale cultivation practices - Kitchen gardening, floating gardens, polyhouse – scope and importance.
- Concept of hybrid seed in vegetables and its utility

Unit: II

- Nutritional status and health benefits of different vegetables
- Root crops: carrot, radish.
- Stem tubers: potato, Knol-Khol.

- Leafy vegetables: brassica (hak), spinach, onion.
- Fruit vegetables: tomato, brinjal.
- Spices: chillies, garlic.

Unit: III

- Classification of plant pathogenic organisms of important vegetable crops (insect and fungal)
- Management of common insect pests and fungal diseases in vegetable crops.
- Post harvest handling and transport in vegetable crops

Unit: IV

- Status and scope of floriculture in India and J&K, ornamental horticulture in improving environment and quality of life.
- Nursery and seed production in ornamental plants, production of bulbous plants.
- Concept of hi-tech floriculture, cut flower production and trade (storage, packaging, transport and marketing of cutflowers)

Laboratory Exercises: L-05

1. Sample collection for study of various diseases and disease symptoms in vegetable crops.
2. Study the preparation of vegetable pickle, Apple Jam and Juice, Tomato sauce.
3. Field visit to fruit preservation center.
4. Field visit to nearby grading/ packing sheds to study the methods of grading, packing, storing, handling and transport of fruits.
5. Study of characteristics of different vegetable crops as studied in the theory.
6. Techniques of raising ornamental plants

Hort-06 (B. Sc. 6th Semester)

Unit: I

- Germplasm concept, importance of documentation and conservation of germplasm of temperate fruit crops like apple, pear, apricot and cherry.
- Genetic variability (types of cultivars) in fruit crops of Kashmir with special reference to apple, almond, cherry and apricot.
- Concept of monoculture and consequences of germplasm depletion in major fruit crops of J&K.

Unit: II

- Biotechnological interventions in horticultural crops, scope and importance of biotechnology in horticulture
- Applications of tissue culture in horticultural crops - micropropagation and scope for commercialization, application of micro-grafting in horticultural crops.
- Role of genetic engineering – genetically modified horticultural crops – scope and limitations.

Unit: III

- Scope of medicinal plants for commercial cultivation.
- Botanical description, chemical constituents and medicinal importance of : *Artemisia absinthum*, *Dioscorea deltoidea*, *Lavandula officinalis*, *Mentha arvensis*, *Thymus serpyllum*, *Crocus sativus*.
- IUCN threat categories of medicinal and aromatic plants.

Unit: IV

- Marketing of fruits, modern satellite mandies, good marketing practices.
- Agribusiness- definition, structure and special feature of agribusiness
- Budgeting –partial budgeting enterprise budgeting, cash flow budgeting, limitations of budgeting.
- Concept of entrepreneurship in horticulture sector, entrepreneurship development programs, Govt. schemes and incentives for promotion of entrepreneurship.

Laboratory Exercises: L-06

- Collection of medicinal and aromatic plants from their natural habitat and study their morphological features, nursery techniques, harvesting, curing and processing techniques and extraction of essential oils.
- Seed dormancy, seed viability by tetrazolium test and seed germination tests.
- Preparation of nursery beds and sowing of seeds. Seed treatments for breaking dormancy.
- Practical demonstration on micropropagation through tissue culture.

Recommended Books:

- Adams, C.R., K.M. Bandford and M. P Early. 1996. *Principals of Horticulture*. CBS Publishers and Distributors, New Delhi.
- Bhattacharjee. S. K. 2006. *Amenity Horticulture, Biotechnology and Post Harvest Technology*. Pointer Publishers. Jaipur

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- Bose, T.K. 1996. *Fruits of India – tropical and subtropical*. Nayaprakash. Kolkatta.
- Bose, T.K., S. K. Mitra and D.S Rathore. 1998. *Temperate fruits*. Nayaprakash. Kolkatta.
- Chada, K. L. 2001. *Handbook of Horticulture*. ICAR, Delhi.
- Chattopadhyay, S.G.1998. *Principles and Procedures of Plant Protection*. Oxford and IBH Publication, New Delhi.
- Chattopadhyaya, P.K.2001. *A text Book of Pomology (Fundamentals of fruit growing)*. Kalyani Publication, New Delhi.
- Edmond, J. B. T., L. Senn, F. S. Andrews and P. G. Halfacre. 1975. *Fundamentals of Horticulture*, Tata M. Graw Hill publication New Delhi.
- Hartman, H.T. and Kester, D.E.1986. *Plant Propagation- Principals and Practices*. Prentice Hall of India Ltd., New Delhi.
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- Jitender Sing. 2006. *Basic Horticulture*. Kalyani Publishers, New Delhi.
- Kumar, N. 1997. *Introduction to Horticulture*. Rajalakshmi publication, Ngercoil.
- Mitra, S. K., T. K. Bose and D. S. Rathore. 1990 *Temperate Fruits*. Horticulture and Allied publishers.
- Narayansawmy, P. 1997. *Plant Pathogens and Detection and Disease Diagnosis*, CRC publication USA.
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- Rao, M. K. 1991. *Text Book of Horticulture*. Macmillan India Ltd New Delhi.
- Sureshkumar, P. Sagar and Manesh Knawat. 2009. *Post Harvest Physiology and Quality Management of Fruits and Vegetables*. Agrotech publishers, udiapur.
- Uma Shanker Sing. 2008. *Indian Vegetables*. Anmol Publications Pvt. Ltd. New Dlhi
- Vijiakumar, Umrao. 2008. *Horticulture Terms- Definitions and Terminology*. IBD Publishers, Dehradun.