



4. B.Sc. (Hort.) SECOND YEAR SECOND SEMESTER

4.1 Breeding of Fruit and Plantation Crops [PBG 221] 3 (2+1)

Fruit breeding - History, importance in fruit production, distribution, domestication and adaptation of commercially important fruits, variability for economic traits, breeding strategies, clonal selection, bud mutations, mutagenesis and its application in crop improvement policy manipulations - in vitro breeding tools (important fruit and plantation crops).

Practical:

Exercises on floral biology, pollen viability; emasculation and pollination procedures; hybrid seed germination; raising and evaluation of segregating populations; use of mutagens to induce mutations and polyploidy.

Reference Books:

1. Ferwerden FP & Wit F. (Ed.). 1969. Outlines of Perennial Crop Breeding in the Tropics. H. Veenman & Zonen.
2. Chadha KL, Ravindran PN & Sahijram L. 2000. Biotechnology in Horticultural and Plantation Crops. Malhotra Publ. House.
3. Kumar, N. Breeding of horticultural crop. New India Publishing agency.
4. Reddey, Mallikarjuna. Plant Breeding in horticulture. Pacific Books International.
5. Verma, L.R. Fruit crop pollination. Kalyani Publisher.

4.2 Insect Pests of Fruit, Plantation, Medicinal and Aromatic Crops [ENTO 221] 3(2+1)

General economic classification of insects; ecology and insect-pest management with reference to fruit, plantation, medicinal and aromatic crops; pest surveillance. Distribution, host range, bio-ecology, injury, integrated management of important insect pests affecting tropical, sub-tropical and temperate fruits, plantation, medicinal and aromatic crops like coconut, areca nut, oil palm, cashew, cacao, tea, coffee, cinchona, rubber, betel vine senna,



neem, hemp, *Belladonna*, *Pyrethrum*, *Camphor*, *Costus*, *Crotalaria*, *Datura*, *Dioscorea*, mint, *Opium*, *Solanum khasianum* and *Tephrosia*.. Storage insects - distribution, host range, bioecology, injury, integrated management of important insect pests attacking stored fruits, plantation, medicinal and aromatic crops and their processed products. Toxicology - insecticide residue problems in fruit, plantation, medicinal and aromatic crops and their tolerance limits.

Practical:

Study of symptoms of damage, collection, identification, preservation, assessment of damage and population of important insect pests affecting fruits, plantation, medicinal and aromatic crops in field and storage.

References books:-

1. Butani, D.K. Insect and Fruits.
2. Gupta, H.C.L., Ameta, O.P. and Chechani, S. Management of Insect-pest of Horticultural Crops. Agrotech Publishing Academy, Udaipur, Rajasthan.
3. Atwal, A.S. and Dhaliwal, G.S. (2008) Agricultural pests of South-East Asia and their management. Kalyani Publishers, New Delhi.
4. David, V.B. and Swami Kumar. (2001) Elements of Economic Entomology. Popular Book Depot, Chennai, India.
5. Singh, R.N. and Singh, J. (2008) Manual on applied Acarology. BHU, Varanasi.
6. Srivastava, K.P. (1996) A text book of applied entomology Vol. I. Kalyani publishers, New Delhi.
7. Gulati Rachna and Kumari Beena (2013) Pest Management and Residual Analysis in Horticultural Crops: An Integrated approach. New India Publishing Agency, New Delhi.

**4.3 Human Values and Professional Ethics-II [EXT 221]
3 (1+2)**

Module 1: Harmony in the Family and Society-

Understanding harmony in the Family - the basic unit of human interaction, Understanding values in human- human relationship; meaning of



Nyaya and program for its fulfillment to ensure Ubhaya- tripti; Trust (Visvasa) and Respect (Sammann) as the foundational values of relationship Understanding the meaning of visvasa; Difference between intention and competence Understanding the meaning of Sammana, Difference between respect and differentiation the other salient values in relationship Understanding the harmony in the society (society being an extension of family): Samadhana, Samriddhi, Abhaya, Sah-astitva as comprehensive Human Goals Visualizing a universal harmonious order in society- undivided society (Akhand samaj), Universal order (Sarvabhauma Vyavastha) - from family to world family.

Module 2: Harmony in the Nature (Existence)-

Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature, Understanding existence as co- existence (Sah-astitva) of mutually interacting units in all- pervasive space, Holistic perception of harmony at all levels of existence

Module 3: Implications of the Holistic Understanding- A look at Professional Ethics-

Natural acceptance of human Values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution for augmenting universal human Order, Competence in Professional Ethics; (a) Ability to utilize the professional competence for augmenting universal human order, (b) Ability to utilize the scope and characteristic of people- friendly and eco- friendly production systems, technologies and management models, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order; (a) At the level of individual : as socially and ecologically responsible engineers, technologists and managers (b) At the level of society :as mutually enriching intuition and organizations

**Practical****Module 1: Introduction to Value Education**

- Exercise 1.** From small groups in the class and make them carry out a dialogue focusing on the following eight questions related to 'TRUST'
- 1a. Do I want to make myself happy - 2a. Do I want to make other happy - 3a. Does the other want to make himself/herself happy - 4a. Does the other want to make me happy - What are the answers - Intention (Natural Acceptance): 1b. Am I able to always make myself happy - 2b. am I able to Always make the other happy - 3b. Is the other able to always make himself/herself happy - 4b. is the other able to always make me happy - What are the answers - Competence: Let each student answer the questions for himself. Discuss the difference between intention and competence. Observe whether you evaluate yourself and others on the basis of intention or competence.
- Exercise 2.** Find out the plants and shrubs growing in and around your campus which can be useful in curing common diseases.
- Exercise 3.** Observe on how many occasions, you are able to respect your related ones (by doing the right evaluation) and on how many occasions you are disrespecting by way of under evaluation, over evaluation. Also, observe whether you're feeling of respect is based on treating the other as you would treat yourself or on differentiations based on body, physical facilities or beliefs.
- Exercise 4.** Write a narration in the form of a story, Poem, skit or essay to clarify a salient Human value to the children. Recollect and narrate an incident in your life where you were able to exhibit willful adherence to values in a difficult situation.
- Exercise 5.** List down some common units (things) of nature which you come across in your daily life and classify them in the four orders of nature. Analyse and explain the aspect of mutual fulfillment of each unit with other orders.



- Exercise 6:** Make a chart to show the whole existence as co-existence. With the help of this chart try to identify the role and the scope of some of the courses or your study. Also indicate the areas which are being either over – emphasized or ignored in the present context.
- Exercise 7:** Identify any two important problems being faced by the society today and analyze the root cause of these problems. Can these be solved on the basis of natural nceptances of human values - If so, how should one proceed in this direction from the present situation -
- Exercise 8:** Suggest ways in which you can use your knowledge of Science/ technology for moving towards a universal human order. Propose a broad outline for Humanistic Constitution at the level of Nation.
- Exercise 9:** Evaluate honestly what difference in your thinking the course has made. Summarize the core message of this course grasped by you. How has this affected you in terms of thought, behavior, work and realization - What practical steps are you able to visualize for transition of the society from its present state.
- Exercise 10:** Film/ Documentary Shows: Selected items followed by thorough discussion

References:

1. Gaur, R.R. and Sangal, R. and Bagaria, G.P. (2009): A Foundation Course in human Valuesa and Professional Ethics, Excel Books, New Delhi.
2. Illich Ivan (1974) Energy and equity, the Trinity Press, Worcester, and Harper Collins, USA.
3. Schumacher, E.F. (1973) Small is Beautiful: a study of economics as if people mattered, Blond and Briggs, Britain.
4. George Sussan (1976) How the other half dies, Penguin Press, Reprinted 1986, 1991.
5. Meadows Donella H, Dennis L., Jorgen Randers, William W., Behrens III (1972) Limits to Growth – Club of Rome report, Universe Books.
6. Anagraj (1998) JeevanVidyaekParichay, Divya path Sansthan, Amarkantak.



7. Dhar P.L. and Gaur RR (1990) Science and Humanism, Commonwealth Publishers.
8. Tripathy A.N. (2003) Human Values, New Age International Publishers.
9. Palekar Subhash (2000) How to practice natural Farming, Pracheen (Vaidik) Krishi TantraShodh, Amravati.
10. Seebauer E.G. and Berry Robert L. (2000) Fundamentals of Ethics for Scientists and Engineers, Oxford University Press
11. M.Govindrajan, S Natrajan and V.S. Senthil Kumar, Engineering Ethics (including human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
12. B.P. Bannerjee, (2005). Foundations of Ethics and Management, Excel Books.
13. B.L.Bajpai, (2004). Indian Ethos and Modern Management, New Royal book Co. Lucknow, Reprinted (2008).

4.4 Mushroom Culture [PPT 221] 1(0+1)

Practical:

Introduction to mushrooms fungi - nutritional value, edible and poisonous types, edible mushrooms, *Pleurotus*, *Volvariella* and *Agaricus*, medicinal value of mushrooms, genetic improvement of mushroom, preparation of culture, mother spawn production, multiplication of spawn, cultivation techniques, harvesting, packing and storage; problems in cultivation -diseases, pest and nematodes - weed moulds and their management strategies. Economics of cultivation, post harvest technologies. Equipment and sterilization techniques for culture media, isolation of mother culture, and spawn preparation and maintenance of mushroom beds of *Oyster* mushroom, *Volvariella* and *Agaricus*. Processing and preservations of mushrooms, economics of spawn and mushroom production and mushroom recipes.

**Reference Books:**

1. Verma L.R, and Sharma R.C. (1999). Diseases of Horticultural Crops: Vegetables, Ornamentals, and Mushrooms ,Indus Publishing Co., New Delhi.
2. Kapoor, J.N. (2010). Mushroom cultivation, ICAR, New Delhi.
3. Singh, A.K. (2002). Mushroom Utpadan and prabandhan , Kalyani Publication, New Delhi.
4. Day, S.C. (2013)Mushroom growing , Agrobios, New Delhi.
5. Singh, Reeti and Singh U.C. (2011). Modern Mushroom Cultivation, Agrobios, Jodhpur,
6. Kaul, T.N. and B.L. Dhar. (2007). Biology and cultivation of edible mushrooms. Publisher: Westville Publishing House.

4.5 Orchard Management [FSC 211]**2(1+1)**

Orchard management, importance, objectives, merits and demerits, clean cultivation, sod culture, Sod mulch, herbicides and inorganic and organic mulches. Tropical, sub-tropical and temperate horticultural systems, competitive and complimentary effect of root and shoot systems. Biological efficiency of cropping systems in horticulture, systems of irrigation. Soil management in relation to nutrient and water uptake and their effect on soil environment, moisture, organisms and soil properties. Integrated nutrient and pest management. Utilization of resources constraints in existing systems. Crop model and crop regulation in relation to cropping systems.

Practical: Layout of different systems of orchard, soil management, clean, inter, cover and mixed cropping, fillers. Use of mulch materials, organic and inorganic, moisture conservation, weeds control. Layout of various irrigation systems.

Reference books:

1. Chattopadhyay, T.K. (2007). A Text book of Pomology Vol-I, Fundamentals of Fruit Growing. Kalyani Publishers, Rajendra Nagar, Ludhiana.



2. Bal, J.S. (2006). Fruit Growing. Kalyani Publishers, Rajendra Nagar, Ludhiana
3. Chadha, K.L. (2005). Hand book of Horticulture. ICAR, New Delhi.
4. Kunte, Y.N. (2002). Principles of Horticulture & fruit Growing 10th edn. Atalas Book Centre Delhi.
5. Singh, Amar (2000). Fruit physiology and production. Kalyani publishers, Ludhiana.

4.6 Ornamental Horticulture [FLA 221]

3 (2+1)

History, scope of gardening, aesthetic values. Gardens in India, types of gardens. Landscaping, historical background, definition. Floriculture industry: importance, area and production, industrial importance in India. Landscaping, basic principles and basic components. Principles of gardening, garden components, adornments, lawn making, methods of designing rockery, water garden, etc. Special types of gardens, their walk-paths, bridges, constructed features. Greenhouse. Special types of gardens, trees, their design, values in landscaping, propagation, planting shrubs and herbaceous perennials. Importance, design values, propagation, plating, climbers and creepers, palms, ferns, grasses and cacti succulents. Flower arrangement: importance, production details and cultural operations, constraints, post-harvest practices. Bio-aesthetic planning, definition, need, round country planning, urban planning and planting avenues, schools, villages, beautifying railway stations, dam sites, hydroelectric stations, colonies, river banks, planting material for play grounds. Vertical gardens, roof gardens. Culture of bonsai, art of making bonsai. Parks and public gardens.

Practical:

Identification and description of annuals, herbaceous, perennials, climbers, creepers, foliage flowering shrubs, trees, palms, ferns, ornamental grasses; cacti succulents. Planning and designing gardens, layout of location of components of garden study, functional uses of plants in the landscape. Planning design of house garden, roadside planting, avenues for new colonies, traffic islands, preparation of land for lawn and planting. Description and design of garden structures, layout of rockery, water garden, terrace garden, and Japanese



gardens, recreational and children corner. Layout of terrarium, traffic islands, bottle garden, dish garden. Flower arrangement, bonsai practicing and training. Visit to nearby gardens. Identification and description of species/varieties of jasmine, chrysanthemum, marigold, dahlia, gladiolus, carnation, aster and their important inter-culture practices

Reference books:-

1. Floriculture in India- Randhawa and Mukhopadhyaya
2. Flowering Trees- M. S. Randhawa
3. The Rose in India- B. P. Pal
4. Beautiful Shrubs- Pratibha. P. Trivedi
5. Commercial Floriculture- Prasad and Kumar
6. Floriculture and Landscaping- Bose, Maiti, Dhua and Das (eds.)

4.7 Plantation Crops [PSMA 221]

3(2+1)

History and development, scope and importance, area and production, export and import potential, role in national and state economy, uses, industrial importance, by products utilization, soil and climate, varieties, propagation: principles and practices of seed, vegetative and micro-propagation, planting systems and method, gap filling, systems of cultivation, mulching, shade regulation, weed and water management, training, pruning and handling, nutrition, foliar feeding, role of growth regulators, soil management, liming practices, tipping practices, top working, physiological disorders, harvesting, post-harvest handling and processing, packaging and marketing, yield and economics of coconut, arecanut, oil palm, palmyrah palm, cacao, cashew nut, coffee, tea and rubber.

Practical:

Description and identification of coconut varieties, selection of coconut and arecanut mother palm and seed nut, planting of seed nuts in nursery, layout and planting of coconut, arecanut, oil palm, cashew nut, cacao gardens, manuring, irrigation; mulching, raising masonry nursery for palm, nursery management in cacao. Description and identification of species and varieties in coffee, harvesting, grading, pulping, fermenting, washing, drying and packing of



coffee, seed berry collection, seed extraction, treatment and sowing of coffee, epicotyl, softwood grafting and top working in cashew, working out the economics and project preparation for coconut, arecanut, oil palm, cashew nut, cacao, etc. Mother plant selection, preparation of cuttings and rooting of tea under specialized structure, training, centering, pruning, tipping and harvesting of tea.

Reference Books:

1. K.V. Peter. (2001). Plantation Crops. National Book trust of India.
2. Kumar, N.; Md. Abdul Khader, J.B.M.; Rangaswami, P. and Irulappan I. (2003). Introduction to Spices, Plantation Crops, Medicinal and Aromatic Plants. Oxford & IBH publishing Co. Pvt. Ltd., New Delhi.
3. Harler, C.R.(1963) The culture and Marketing of tea. Oxford Univeersity Press.
4. Kurian, A. and Peter, KV. (2007) Commercial Crop technology. New India Publication Agency.
5. Nair, M.K.; Bhaskar; Rao, EVV; Nambiar, KKN and Nambiar, M.C. (CPCRI. Cashew. Kasaragod.
6. Peter, KV. (2002) Plantation Crops. National Book Trust.
7. Srivastava, HC; Vatsaya, B. and Menon, KKG.(1986) Plantation Crops-opportunities and Constrains. Oxford & IBH publishing Co. Pvt. Ltd., New Delhi.
8. Ranganathan, V. (1979) Hand book of tea Cultivation.UPASI, Tea Research Station, Cinchona.

4.8 Spices and Condiments [PSMA 222] 2(1+1)

History, scope and importance, area and production, uses, export potential and role in national economy. Classification, soil and climate, propagation-seed, vegetative and micro-propagation systems and methods of planting. Nutritional management, irrigation practices, weed control, mulching and cover cropping. Training and pruning practices, role of growth regulators, shade crops and shade regulation. Harvesting, post-harvest technology,



packaging, storage, value added products, methods of extraction of essential oil and oleoresins. Economics of cultivation, role of Spice Board and Pepper Export Promotion Council, institutions and research centers in R&D. Crops: Cardamom, pepper, ginger, turmeric, clove, nutmeg, cinnamon, all spice, curry leaf, coriander, fenugreek, fennel, cumin, dill, celery, bishops weed, saffron, vanilla, thyme and rosemary.

Practical:

Identification of varieties: propagation, seed treatment - sowing; layout, planting; hoeing and earthing up; manuring and use of weedicides, training and pruning; fixing maturity standards, harvesting, curing, processing, grading and extraction of essential oils and oleoresins. Visit to commercial plantations.

Reference Books:

1. Agrawal, S.; Sastry, EVD and Sharma, RK. (2001) Seed Spices: Production, quality, Export. Pointer publication.
2. Arya, P.S. (2003) Spices crops of India. Pointer publication.
3. Bose, T.K.; Farooqi, S.K. and Sadhu, M.K. (1999) Tropical Horticulture. Vol. I. Naya Prokash.
4. Chadha, K.L. and Rethinam, P. (eds.) (1993) Advances in Horticulture. Malhotra Publishing House.
5. Hand Book of Spices and packaging with Formulae. Engineering India Research Institute, New Delhi.
6. Kumar, NA; P. Khader; Rangaswami, V. and Irulappan I. (2000) Introduction to Spices, Plantation Crops, Medicinal and Aromatic Plants. Oxford & IBH publishing Co. Pvt. Ltd., New Delhi.
7. Nybe, EV; Miniraj, N. and Peter, K.V. (2007) Spices. New India Publication Agency.
8. Parthasarthy, V.A.; Kandiannan, V. and Srinivasan, V. (2008) Organic Spices. New India Publication Agency
9. Peter, K.V. (2001) Hand books of Herbs and Spices. Vols I-III. Woodhead Publication Co. UK and CRC USA.
10. Pruthi, J.S. (Ed) (1998) Spices and Condiments. National Book Trust.



11. Pruthi, J.S. (2001) Miner Spices and Condiments-Crop Management and Post Harvest Technology. ICAR, New Delhi.
12. Purseglove, J.W.; Brown, E.G. and Green, CL and Robbins, SRJ. (Eds.) (1981). Spices Vols. I and II Longman.
13. Shamugavelu, K.G.; Kumar, N. and Peter, K.V. (2002) Production Technology of Species and Plantation Crops. Agrobios.
14. Thamburaj, S. and Singh, N. (Eds) (2004) Vegetable, Tuber crops and Spices. ICAR.
15. Tiwari R.S. and Agrawal A. (2004) Production technology of Spices. International Book Distribution Co.
16. Varmudy, K. (2001) Marketing of Spices. Daya Publishing House.

4.9 Soil and Plant Analysis [SAC 221] 2(1+1)

Methods of soil and plant sampling and processing for analysis. Quantification of minerals and their abundance. Soil structure and aggregate analysis. Theories and concepts of soil moisture estimation - gravimetric, tensiometric, gypsum block, neutron probe and pressure methods. Characterization of hydraulic mobility - diffusion and mass flow. Renewal of gases in soil and their abundance. Methods of estimation of oxygen diffusion rate and redox potential. Soil fertility evaluation methods. Use of radio tracer techniques in soil fertility evaluation. Soil micro-organisms and their importance. Saline, alkali, acid, waterlogged and sandy soils, their appraisal and management. Chemical and mineral composition of horticultural crops. Leaf analysis standards, index tissue, interpretation of leaf analysis values. Principles of working of pH meter, electrical conductivity meter, spectrophotometer, flame photometer and atomic absorption spectrophotometer. Quality of irrigation water.

Practical:

Collection and preparation of soil and plant samples for analysis. Determination of water holding capacity and hydraulic conductivity of soil. Estimation of moisture content in soils and plants. Determination of pH,



electrical conductivity, sodium adsorption ratio and exchangeable sodium percentage of soils. Enumeration of soil microbes. Estimation of available macro and micronutrient elements in soils and their contents in plants. Irrigation water quality analysis.

Reference Books:

1. Ghildyal, B.P. and Tripathi, R. P. Soil physics. Wiley Eastern limited, New Delhi.
2. Kanwar and Chopra. Agricultural Analytical Chemistry.
3. Premijit, Sharma. Agricultural water Management. Biotech publishers, Udaipur.
4. Ali and Tahir. Manual of soil plant and water analysis. Astral publishers, New Delhi.
5. Bandopadhyay. Soil analysis Biotech publishers, Udaipur.
6. Bennett, H.H. Soil Conservation for sustainable agriculture. Agrobios, Jodhpur.
7. Patiram, Soil testing and Analysis. NIPA, New Delhi.