SEMESTER-IV

HORT 251: Dryland Horticulture 2(1+1)

Theory

Definition, importance and limitation of dry land horticulture, present status and future scope. Constraints encounter in dry lands. Agro-climatic features in rain shadow areas, scarce water resources, high temperature, soil erosion, run-off losses etc.

Techniques and management of dry land horticulture. watershed development, soil and water conservation methods-terraces, contour bunds,etc. Methods of control and impounding of run-off water-farm ponds, trenches, macro catch pits,etc.,*in-situ* water harvesting methods, micro catchment, different types of tree basins etc. Methods of reducing evapotranspiration, use of shelter belts, mulches, antitranspirants, growth regulators, etc. water use efficiency-need based, economic and conjunctive use of water, micro systems of irrigation etc.

Selection of plants having drought resistance. Special techniques, planting and after care-use of seedling races, root stocks, *in-situ* grafting, deep pitting/planting, canopy management etc.

Characters and special adaptation of crops: ber, aonla, annona, jamun, wood apple, bael, pomegranate, carissa, date palm, phalsa, fig, west Indian cherry and tamarind.

Practical

Study of rainfall patterns. Contour bunding/trenching, micro catchments, soil erosion and its control. Study of evapotranspiration, mulches and micro irrigation systems. Special techniques of planting and aftercare in dry lands. Study of morphological and anatomical features of drought tolerant fruit crops.

Suggested reading:

Chundawat, B.S. 1990. *Arid Fruit Culture*. Oxford and IBH, New Delhi.

P.L. Taroj, B.B. Vashishtha, D.G.Dhandar. 2004. *Advances in Arid Horticulture*. Internal Book Distributing Co., Lucknow.

T. Pradeep Kumar, B. Suma, Jyothi Bhaskar and K.N.Sathesan. 2008. *Management of Horticultural Crops*. New India Publishing Agency.

HORT 252: Plantation Crops 3 (2+1)

Theory

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, Date palm 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.

Suggested Reading:

Kumar, N.J.B. M. Md. Abdul Khaddar, Ranga Swamy, P. and Irrulappan, I. 1997. *Introduction to spices, Plantation crops and Aromatic plants*. Oxford & IBH, New Delhi.
Thampan, P.K. 1981.*Hand Book of Coconut Palm*. Oxford IBH, New Delhi.
Nair 1979. *Cashew.* CPCRI, Kerala
Wood, GAR, 1975. *Cacao*. Longmen, London
Ranganadhan, V. 1979. *Hand Book of Tea Cultivation*. UPASI Tea Research Station, Cinchona.
Thompson, P.K. 1980. *Coconut.* Oxford & IBH Publishing Co. Ltd., New Delhi.

HORT 253: Spices and Condiments 3(2+1)

Theory

History, scope and importance, Present status, area and production, uses, export potential and role in national economy. Classification, soil and climate, propagation-seed, vegetative and micropropagation 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, betel vine 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.

Suggested Reading:

Shanmugavelu, K.G. Kumar, N and Peter, K.V., 2005. *Production technology of spices and plantation crops*. . Agrosis, Jodhpur
Shanmugavelu, K.G. and Madhava Rao, 1977. *Spices and Plantation Crops*. Madras Popular Book Depot.
Kumar, N. J.B. M. Md. Abdul khaddar, Ranga Swamy, P. and Irulappan, I., 1997. *Introduction to Spices, Plantation Crops, and aromatic crops*. Oxford & IBH, New Delhi.
Pruthi, J.S., 1980. *Spices and Condiments*. Academic Press, New York.
Pruthi, J.S., 1993. *Major Spices of India- Crop Management Postharvest Technology*. ICAR, New Delhi.
Pruthi, J.S., 2001. *Minor Spices and Condiments-Crop ManagementPost Harvest Technology.* ICAR, New Delhi.
Purseglove, Brown, E.G. Green, G.Z. Robbins, S.R.J. London, Longman, 1981. *Spices* Vol.I & II.

HORT 254: Breeding of Fruit and Plantation Crops 3 (2+1)

Theory

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 in major crops like Mango, Banana, Citrus, Grapes, Guava, Sapota, Papaya, Custard apple, Aonla, Ber, Litchi, Pomegranate, Jamun, Arecanut, Coconut, Pistchonut, Apple, Pear, Plum, Peach, Apricut and Strawberry.

Nijar 1985.*Fruit breeding in India*,Oxford & IBH Publishing Co. New Delhi
Anil Kumar Shukla 2004. *Fruit breeding approaches & Achievements*.
International Book Distributing Co. New Delhi.
Kumar, N. 1997. *Breeding of Horticultural Crops, Principles and Practices*. New
India Publishing Agency, New Delhi.
Singh, B.D. 1983.*Plant Breeding Principles and methods*. Kalyani Publishers,
New Delhi.

HORT 255: Precision Farming & Protected Cultivation 3 (2+1)

Theory

Precision farming – laser leveling, mechanized direct seed sowing; seedling and sapling transplanting, mapping of soils and plant attributes, site specific input application, weed management, insect pests and disease management, yield mapping in horticultural crops. Green house technology, Introduction, Types of Green Houses; Plant response to Greenhouse environment, Planning and design of greenhouses, Design criteria of greenhouse for cooling and heating purposes. Green house equipment, materials of construction for traditional and low cost green houses. Irrigation systems used in greenhouses, Typical applications, passive solar green house, hot air greenhouse heating systems, green house drying. Cost estimation and economic analysis. Choice of crops for cultivation under greenhouses, problems / constraints of greenhouse cultivation and future strategies. Growing media, soil culture, type of soil required, drainage, flooding and leaching, soil pasteurization in peat moss and mixtures, rock wool and other inert media, nutrient film technique (NFT) / hydroponics.

Practical

Study of different types of greenhouses based on shape, construction and cladding materials; Calculation of air rate exchange in an active summer winter cooling system; Calculation of rate of air exchange in an active winter cooling system; Estimation of drying rate of agricultural products inside green house; Testing of soil and water to study its suitability for growing crops in greenhouses; The study of fertigation requirements for greenhouses crops and estimation of E.C. in the fertigation solution; The study of various growing media used in raising of greenhouse crops and their preparation and pasteurization / sterilization; Visit to commercial green houses; Economics of protected cultivation.

Suggested Reading:

Balraj Singh. 2006. *Protected cultivation of vegetable crops*. Kalyani Publishers, Ludhiana.
Brahma Singh, 2014.*Advances in Protected Cultivation*. New India Publishing Agency. New Delhi.
Reddy P. Parvatha, 2003. *Protected Cultivation*. Springer Publications. USA.
Reddy, P. Parvatha. 2011. *Sustainable crop protection under Protected Cultivation*. Springer Publications. USA.
Jitendra Singh, 2015.*Precision Farming in Horticulture*. New India Publishing Agency. New Delhi.
Prasad S. 2005. *Greenhouse Management for Horticultural Crops*. Agrobios. Jodhpur.
Jitendra Singh, S.K. Jain, L.K. Dashora, B.S. Cundawat.2013. *Precision forming in Horticulture*. New India Publishing Agency, New Delhi.
T. Pradeep Kumar, B. Suma, Jyothi Bhaskar and K.N.Satheson. 2008. *Management of Horticultural crops*. New India Publishing Agency, New Delhi.
Aldrich RA & Bartok JW. 1994. NRAES,Riley, Robb Hall. *Green House Engineering*. Cornell University, Ithaca, New York.
Pant V Nelson. 1991.*Green House Operation and Management*. Bali Publ

ACSS(H) 256: Soil, Water and Plant Analysis 2(1+1)

Theory

Methods of soil and plant sampling and processing for analysis. 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. 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 Quality of irrigation water. Radio tracer technology application in plant nutrient studies. Rapid tissue tests for soil and plant. Management of poor quality irrigation water in crop management. Soil and Water pollution.

Practical

Introduction to analytical chemistry, Collection and preparation of soil, water and plant samples for analysis. Determination of pH, electrical conductivity, sodium adsorption ratio and exchangeable sodium percentage of soils. Estimation of available macro and micronutrient elements in soils and their contents in plants. Irrigation water quality analysis. Determination of pH and EC in irrigation water samples, Determination of Carbonates and bicarbonates in soil and irrigation water, Determination of Calcium and Magnesium in soil and irrigation water. Determination of N, P, K, Ca, Mg, Sand micronutrients in plant samples. Determination of Sodium, Potassium, Chlorine and Boron in irrigation water.

Suggested Reading:

H.L.S. Tandon. 2013, *Methods of analysis of soil, plant, water and fertilizers*. FDCO, New Delhi.
Yawalkar,K.S.Agarwal,J.P.andBokde,S.,1977. *ManuresandFertilizers*. Agri-HorticulturalPublishingHouse,Nagpur.
Sehgal J. A., 2005. *Textbook of Pedology Concepts and Applications*. Kalyani Publishers, New Delhi.
Jaiswal, P.C., 2006. *Soil, Plant and Water Analysis* (2nd Edition), Kalyani Publishers, Ludhiana.
Jackson M. L, 1967. *Soil Chemical Analysis*, Oxford and IBH Publishing Co., New Delhi.
Richards L A, 1968. *Diagnosis and Improvement of Saline and Alkaline Soils*. Oxford and IBH publishing Co. New Delhi(USDA Hand Book No. 60)
Chopra S.C. and Kanwar, J. S 1976. *Analytical Agricultural Chemistry*, Kalyani Publishers, Ludhiana.
C. S. Piper. 2014, *Soil and plant analysis*, Scientific publishers India.
Mushtaq A. Wan., 2014, *Soil, plant and water analysis manual*. Agrotech publishing company, Udaipur.
P. K. Gupta., 2013, *Soil, plant, water and fertilizer analysis*. Agrobios, India.
M. V. Durai., 2014, *Hand book of Soil, plant, water, fertilizers and manure analysis*. New India publishing agency.

AST(H) 257: Elementary Statistics 3(2+1)

Theory: Introduction to Statistics and its applications. Graphical representation of data. Frequency distribution. Measures of central tendency & dispersion. Definition of Probability, Addition and Multiplication theorem (with proof). Simple problems on probability. Binomial and Poisson Distribution. Normal Distribution. Definition of correlation, Scatter diagram, Karl Pearson's coefficient of correlation. Linear regression equation. Selection of random sample using simple random sampling wit and without replacement. Introduction to test of significance, based on τ, t, F and chi square statistics, chi -square test for goodness of fit and independence of attributes in contingency tables. Analysis of variance, one way and two way classification data analysis. Uniformity trial and fertility contour map. Principles of experimental designs, analysis of field data by three basic designs, viz., CRD, RBD and LSD.

Practical: Formation of Frequency tables. Graphical presentation of data. Measures of central tendency & dispersion (Ungrouped and grouped data). Measures of Skewness and Kurtosis. Simple correlation and regression analysis. Selection of random sample using simple random sampling wit and without replacement. Test of significance, based on τ, t, F and chi square statistics, chi -square test for goodness of fit and independence of attributes in contingency tables. Analysis of variance, one way and two way classification data analysis. Lay-out and analysis of field data by three basic designs, viz., CRD, RBD and LSD.

Suggested Reading:

Gupta, S. C. and Kapoor, V. K. 2014. Fundamentals of Mathematical Statistics. Sultan chand and sons. New Delhi

NageswaraRao,G.2007.*Statisticsfor AgriculturalSciences*. BSPublications,Hyderabad.

Rangaswamy,R.1995.*ATextBookofAgriculturalStatistics*. NewAgeInternationalPublishingLimited, Hyderabad.

Gupta, V.,2002. *ComdexComputerKit*. DreamTechPress,NewDelhi.

Parmar,A.Mathur,N.DeeptiP.U.andPrasanna, V. B.,2000.*WorkingwithWINDOWS A HandsonTutorials*. TataMcGrawHillPublishingCo.,NewDelhi.

Bandari, V. B., 2012. *Fundamentals of Information Technology*. Pearson Education,New Delhi.

Fundamentals of Computers. 2011. Pearson Education-ITL ESL, New Delhi,

AEN(H) 258: Insect Pests of Fruit, Plantation, Medicinal and Aromatic Crops 3(2+1)

Theory

General – economic classification of insects; Bio-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, belladonna, pyrethrum, costus, crotalaria, datura, dioscorea, mint, opium, *Solanum khasianum* and. Storage insects – distribution, host range, bio-ecology, injury, integrated management of important insect pests attacking stored fruits, plantation, medicinal and aromatic crops and their processed products. Insecticide residue problems in fruit, plantation, medicinal and aromatic crops and their maximum residue limits (MRLs).

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.

Suggested Reading:

Reddy, P. P., 2010, Plant Protection in Horticulture Vol. 1, 2 & 3, Scientific Publishers, Jodhpur.
Ranjit, P., 2012, Entomological Techniques in Horticultural Crops, New India Publishing Agency.
Nair M R G K, 1995, Insect and Mites of Crops in India, ICAR, New Delhi.
Ayyar, T.V.R. 1963. Hand book of entomology for south India. Govt. press Madras, 516p.
David B V and Kumarswami, T, 1982. Elements of Economic Entomology. Popular Book Department, Madras, 536p.
David. V. Alford. Pest of fruit crops. A. M. Ranjith. Identification and management of Horticultural pest.
Rachna and Benna kumari. Pest management and residual analysis in horticultural crop
K. P. Srivastav and Y. S. Ahawat. Pest management in citrus
Ramnivas sharma. Identification and management of horticulture pest.
Fryer. Insect pest of fruit crops
A. S. Atwal. Agricultural pests of south Asia and their management
Mark Vernon Slingerland and C. R. Crosby. Manual of fruit insects
Metcalf,R.LandLuckman,W.H.1982. IntroductiontoInsectpestmanagement. WileyInterSciencePublishing,NewYork
Butani,D.K.1984. InsectsandFruits. PeriodicalExpertBookAgency,NewDelhi

AEG(H) 259: Farm Power and Machinery 2(1+1)

Theory

Basic concepts of various forms of energy, unit and dimensions of force energy and power, calculations with realistic examples. IC Engines: Basic principles of operation of compression, ignition and spark ignition engines, two stroke and four stroke engines, cooling and lubrication system, power transmission system, broad understanding of performance and efficiency, tractors, power tillers and their types and uses. Electric motors: types, construction and performance comparison. Tillage: objectives, method of ploughing. Primary tillage implements: construction and function of indigenous ploughs, improved indigenous ploughs, mould board ploughs, disc and rotary ploughs. Secondary tillage implements: construction and function of tillers, harrows, levelers, ridgers and bund formers. Sowing and transplanting equipment: seed drills, potato planters, seedling transplanter. Grafting, pruning and training tools and equipment. Inter-culture equipment: sweep. Junior hoe, weeders, long handle weeders. Crop harvesting equipments: potato diggers, fruit pluckers, tapioca puller and hoists.

Practical

Calculation on force, power and energy. IC engines – showing the components of dismantled engines and motors. Primary and secondary tillage implements, hitching, adjustments and operations. Spraying equipment, calibration and operation. Plant protection equipment, calculation of dilution ratio and operation.

Suggested reading:

T. P. Ojhaand A.M.Michael. 2005. *Principles of Agricultural Engineering* (Volume - 1), Jain Brothers
Manoj Kumar Ghoshal and Dhirendra Kumar Das. 2008. *Farm Power*,Kalyani Publishers.
Surendra Singh. 2007.*Farm Machinery Principles and Applications*. ICAR Publications
Roth / Field. 1992. *Introduction to Agricultural Engineering - Problem Solving Approaches,* 2nd. Edition. CBS publishers & distributors Pvt. Ltd.
Surendra Singh & Verma. 2009. *Farm Machinery Maintenance & Management*. ICAR Publication.
M.M. Pandey & Others. 2012. *Handbook of Agricultural Engineering*. ICAR publication
JagadishwarSahay.1992. *Elementsof AgriculturalEngineering*. AgroBookAgency,Patna.
MichalAMandOjhaTP.1993.*VolI. Principlesof AgriculturalEngineering*.Jain Brothers,NewDelhi.
KepnerRARoyBainerandBargerBL.1978. *PrinciplesofFarmMachinery*. CBSPublisherandDistributors,Delhi.
JainS C. 2003.*FarmMachinery-Anapproach*.StandardPublishersandDistributors,NewDelhi
Nakra,C.P.1986. *FarmMachineryandEquipment*. DhanpatRaiandSons,NewDelhi
Klenin,N.I.Popov,I.F.andSakun,V.A.1985. *AgriculturalMachines*. AmerindpublishingCo.Pvt.Ltd.,NewDelhi.