

MATA GUJRI COLLEGE

FATEHGARH SAHIB

(AN AUTONOMOUS COLLEGE)

RE-ACCREDITED BY NAAC WITH “A” GRADE

“COLLEGE WITH POTENTIAL FOR EXCELLENCE” STATUS BY UGC



SYLLABI

SESSION: (2018-19, 2019-20)

FACULTY OF LIFE SCIENCE

DEPARTMENT OF AGRICULTURE

COURSE: MASTER OF SCIENCE AGRICULTURE

FRUIT SCIENCE

Outline of the Syllabus for Semester-III

M.Sc. Agriculture (Horticulture- Fruit Science)

Semester-III

Paper Code	Subject	Credit hrs		Marks		External Assessment		Internal Assessment		Grand Total
		Theory	Practical	Theory	Practical	Theory	Practical	Theory	Practical	
FBC-501	Food Biochemistry	3	1	75	25	45	25	30	00	100
FSC 503	Biodiversity and Conservation of Fruit Crops	3	1	75	25	45	25	30	00	100
FSC 504	Nutrition of fruit crops	3	1	75	25	45	25	30	00	100
FSC 510	Orchard Management	3	1	75	25	45	25	30	00	100
FSC 599	Master's Research	0	10	00	100	00	100	00	00	100
	Total	12	14	300	200	180	200	120	00	500

*One credit hour of Practical= 2 hours

*One credit hour of Theory= 1 hour

*One credit hour of Master Research= 1 hour

SEMISTER III

FSC 503 BIODIVERSITY AND CONSERVATION OF FRUIT CROPS

Time: 3 Hours

Periods per Week 3+2

Max. Marks: 100

Theory: 75

Theory Internal assessment: 30

Theory external assessment: 45

Practical: 25

INSTRUCTIONS FOR THE PAPER SETTERS /CANDIDATES

The question paper will consist of three sections A, B and C. Section-A will have four questions from unit-I of the syllabus and section-B will have four questions from unit-II of the syllabus carrying 9 marks each. Student will have to attempt two questions from each section. Section - C will consist of 9 short answer type questions which will cover the entire syllabus uniformly and will carry 01 mark for each question. All questions of Section-C are compulsory.

Objective

Understanding the principles of biodiversity and strategies in germplasm conservation of fruit crops.

Theory

Unit I

Biodiversity and conservation; issues and goals. Centers of origin of cultivated fruits. Primary and secondary centers of genetic diversity. Present status of gene centers Exploration and collection of germplasm; conservation of genetic resources – conservation *in situ* and *ex situ*. Germplasm conservation- problem of recalcitrancy - cold storage of scions, tissue culture, cryopreservation, pollen and seed storage Inventory of germplasm, introduction of germplasm, plant quarantine.

Unit- II

Intellectual property rights, regulatory horticulture. Detection of genetic constitution of germplasm and maintenance of core group. GIS and documentation of local biodiversity Geographical indication.

Crops: Mango, sapota, citrus, guava, banana, papaya, grapes, jackfruit, custard, apple, ber, aonla, malus, *Prunus* spp, litchi, nuts, coffee, tea, rubber, cashew, coconut, cocoa, palmyrah, arecanut, oil palm and betelvine.

Practical

1. Documentation of germplasm – maintenance of passport data and other records of accessions.
-

2. Field exploration trips, exercise on *ex situ* conservation – cold storage, pollen/seed storage, cryopreservation.
3. Visits to National Gene Bank and other centers of PGR activities.
4. Detection of genetic constitution of germplasm, core sampling, germplasm characterization using molecular techniques.

Suggested Readings:

1. Frankel OH & Hawkes JG. 1975. *Crop Genetic Resources for Today and Tomorrow*. Cambridge University Press.
 2. Peter KV & Abraham Z. 2007. *Biodiversity in Horticultural Crops*. Vol. I. Daya Publ.House.
 3. Peter KV. 2008. *Biodiversity of Horticultural Crops*. Vol. II. Daya Publ. House.
-

FSC 504 NUTRITION OF FRUIT CROPS

Time: 3 Hours

Periods per Week 3+2

Max. Marks: 100

Theory: 75

Theory Internal assessment: 30

Theory external assessment: 45

Practical: 25

INSTRUCTIONS FOR THE PAPER SETTERS /CANDIDATES

The question paper will consist of three sections A, B and C. Section-A will have four questions from unit-I of the syllabus and section-B will have four questions from unit-II of the syllabus carrying 9 marks each. Student will have to attempt two questions from each section. Section - C will consist of 9 short answer type questions which will cover the entire syllabus uniformly and will carry 01 mark for each question. All questions of Section-C are compulsory.

Objective

Understanding the nutritive value of different fruit crops

Theory

Unit I

Importance and history of nutrition of fruit crops. Primary, secondary and micro elements in nutrition. Role of individual elements on growth and fruiting of fruit crops. Diagnostic methods for determining nutrition requirements - amount of nutrients removed by crop/plant. Foliar diagnosis, visual symptoms of deficiencies/disorders, tissue/plant analysis, soil analysis etc. Evaluation of nutrient status in orchards. DRIS concept of nutrition. Root studies - root distribution as criteria for determining amount and replacement of nutrients.

Unit- II

Nutrient requirements of fruit crops. Methods of nutrients application - soil, foliar etc. Manures and manuring, organic and green manuring and fertilizer application. Need based nutrition, splits and time of application. Soil pH and nutrient availability, soil salinity and other antagonistic factors. Use of soil amendments, salt tolerant crops etc. Special problems - nutritional disorders and developments done.

Practicals:

1. Study of diagnostic techniques for determining nutrient status of fruit crops.
 2. Study of root distribution, leaf sampling techniques.
 3. Study of equipments used in nutrient analysis and chemical analysis of different nutrients.
-

4. Study of deficiency symptoms.
5. Nutrient culture studies, foliar nutrition.
6. Visit to long-term fertilizer experimental plots in research centres.

Suggested Reference:

1. Chudawat, B.S. Fruit Nutrition Management of Fruit Crops. Agritech Publishing Company, Udailpur.
 2. Epstein, E. 1972. Mineral Nutrition of Plants-Principles and Perspectives. John Wiley and Sons, London.
-

FSC 510 ORCHARD MANAGEMENT

Time: 3 Hours

Periods per Week 3+2

Max. Marks: 100

Theory: 75

Theory Internal assessment: 30

Theory external assessment: 45

Practical: 25

INSTRUCTIONS FOR THE PAPER SETTERS /CANDIDATES

The question paper will consist of three sections A, B and C. Section-A will have four questions from unit-I of the syllabus and section-B will have four questions from unit-II of the syllabus carrying 9 marks each. Student will have to attempt two questions from each section. Section - C will consist of 9 short answer type questions which will cover the entire syllabus uniformly and will carry 01 mark for each question. All questions of Section-C are compulsory.

Objective

Understanding the principles, theoretical aspects and developing skills in orchard management of fruit crops.

Theory

Unit I

Definition of orchards, Importance and scope of orchard management, types of orchards, Planning, design and layout of orchards. Selection of crops, varieties and procurement of quality planting material. Establishment of orchards, Soil management practices. Cropping systems in tropical, subtropical, temperate and silvi-horticultural plants, multistoried cropping system.

Unit- II

Soil and water conservation practices in fruit orchards. Management of problematic soils. water, nutrient and weed management. Training, pruning and management of bearing orchard. Canopy management, its importance and advantages. Mechanization in orchard. High density plantations. Harvesting, disposal and marketing of orchard produce, book keeping and accounting.

Practical:

1. Planning, layout and design of different orchards
 2. Planting systems.
 3. Study of different soil management practices, in-situ moisture conservation.
 4. Study of irrigation system including design and layout. weed management
-

5. Estimation of cost of cultivation of fruit production records and maintenance of records.
6. Visit to progressive fruit orchard.

Suggested Reference:

1. Arakeri, H.R. and L. Donahue roy, 1984. Principles of Soil conservation and
 2. Water Management . Oxford and IBH Publishing co, New Delhi.
-

Outline of the Syllabus for Semester-IV
M.Sc. Agriculture (Horticulture- Fruit Science)
Semester-IV

Paper Code	Subject	Credit hrs		Marks		External Assessment		Internal Assessment		Grand Total
		Theory	Practical	Theory	Practical	Theory	Practical	Theory	Practical	
FSC 509	Post-Harvest Technology for Fruit and vegetable Crops	3	1	75	25	45	25	30	00	100
FSC 510	Protected Cultivation and Organic Horticulture	3	1	75	25	45	25	30	00	100
FSC-591	Master's seminar	1	0	100	00	00	00	100	00	100
FSC-599	Master's research	0	10	00	100	00	100	00	00	100
	Total	07	12	250	150	90	150	160	00	400

***One credit hour of Practical= 2 hours**

***One credit hour of Theory= 1 hour**

***One credit hour of Master Research= 1 hour**

SEMISTER IV

PHT 509: POST HARVEST TECHNOLOGY OF FRUIT AND VEGETABLE CROPS

Time: 3 Hours

Max. Marks: 100

Periods per Week 3+2

Theory: 75

Theory Internal assessment: 30

Theory external assessment: 45

Practical: 25

INSTRUCTIONS FOR THE PAPER SETTERS /CANDIDATES

The question paper will consist of three sections A, B and C. Section-A will have four questions from unit-I of the syllabus and section-B will have four questions from unit-II of the syllabus carrying 9 marks each. Student will have to attempt two questions from each section. Section - C will consist of 9 short answer type questions which will cover the entire syllabus uniformly and will carry 1 mark for each question. All questions of section-C are compulsory.

Objective

To facilitate deeper understanding on principles and practices of fruit and vegetable technology

Theory

UNIT I

Importance of postharvest technology. Maturity and ripening. Quality management for fresh marketing of fruit and vegetable. Storage of fruits and vegetables- ventilated, refrigerated, MAS, CA, evaporative cold storage. Fruit and vegetable processing, canning of Fruits and Vegetables. Irradiation, packaging of fresh and processed fruit and vegetable products. Fruit and vegetable based products- Squash, RTS, Syrup, tomato puree, paste, ketchup, sauces, Jam, Jellies, Marmalade and candied fruit, principal and methods of preservation.

UNIT II

Spoilage of fruits and vegetables and their processed products. layout and establishment of processing industry. FPO licence, quality assurance and quality control, TQM, GMP, Food standards – FPO, PFA, etc. Food laws and regulations, Food safety – Hazard analysis and critical control points (HACCP). Utilization of fruit and vegetable processing waste. Marketing and export of fresh and processed products, drying and dehydration of fruits and vegetables. Fermented fruit beverages, unfermented fruit beverages.

Sensory evaluation of fruit and vegetable products. Nutritionally enriched fruit and vegetable products.

Practical

List of Practical's

1. Analyzing maturity stages of commercially important horticultural crops
2. Physiological loss in weight of fruits and vegetables
3. Improved packing and storage of important horticultural commodities
4. Study of machinery and equipment's used in processing of horticultural produce
5. Preparation and analysis of syrups and Brines for the preservation of fruits and vegetables.
6. Preparation of fruits and vegetable products e.g. Jam, jellies, marmalades, ketchup and sauces.
7. Collection of different type of packaging materials for solid and liquid food
8. Estimation of quality characteristics in fresh and stored fruits and vegetables
9. Study of different types of spoilages in fresh as well as processed horticultural produce
10. Sensory evaluation of fresh and processed fruits and vegetables
11. Visit to cold storage units
12. Visit to processing units to study the layout
13. Project preparation for fruits and vegetable products

Suggested Readings

1. Arthey D & Dennis C. 1996. *Vegetable Processing*. Blackie/Springer- Verlag.
 2. Chadha DS. 2006. *The Prevention of Food Adulteration Act*. Confed. of Indian Industry.
 3. FAO. 1997. *Fruit and Vegetable Processing*. FAO.
 4. FAO. *CODEX Alimentarius: Joint FAO/WHO Food Standards Programme*. 2nd Ed. Vol. VB. *Tropical Fresh Fruits and Vegetables*. FAO.
 5. FAO. *Food Quality and Safety Systems – Training Manual on Food Hygiene and HACCP*. FAO.
 6. Fellow's P. 1988. *Food Processing Technology*. Ellis Horwood International.
 7. Giridharilal GS, Siddappa&Tandon GL. 1986. *Preservation of Fruits and Vegetables*. ICAR.
 8. Graham HD. 1980. *Safety of Foods*. AVI Publ. Co.
 9. Ranganna S. 1986. *Handbook of Analysis and Quality Control for Fruit and Vegetable Products*. 2nd Ed. Tata-McGraw Hill.
 10. Srivastava RP & Kumar S. 2003. *Fruit and Vegetable Preservation: Principles and Practices*. 3rd Ed. International Book Distri. Co.
 11. Verma LR & Joshi VK. 2000. *Post-harvest Technology of Fruits and Vegetables: Handling, Processing, Fermentation and Waste Management*. Indus Publ. Co.
-

FSC 510 PROTECTED CULTIVATION AND ORGANIC HORTICULTURE

Time: 3 Hours

Max. Marks: 100

Periods per Week 3+2

Theory: 75

Theory Internal assessment: 30

Theory external assessment: 45

Practical: 25

INSTRUCTIONS FOR THE PAPER SETTERS /CANDIDATES

The question paper will consist of three sections A, B and C. Section-A will have four questions from unit-I of the syllabus and section-B will have four questions from unit-II of the syllabus carrying 9 marks each. Student will have to attempt two questions from each section. Section - C will consist of 9 short answer type questions which will cover the entire syllabus uniformly and will carry 01 mark for each question. All questions of Section-C are compulsory.

Objective

Understanding the principles, theoretical aspects and developing skills in protected cultivation of fruit crops and to develop understanding of organic horticulture production system.

Theory

Unit- I

Greenhouse – World scenario, Indian situation: present and future. Different agro climatic zones in India. Basics of greenhouse design, different types of structures – glasshouse, shade net, poly tunnels - Design and development of low cost greenhouse structures. Interaction of light, temperature, humidity and CO₂ on crop regulation, Greenhouse heating, cooling, ventilation and shading. Types of ventilation- Forced cooling techniques - Glazing materials Micro irrigation and Fertigation. Organic horticulture – definition, principles, methods, merits and demerits.

Unit- II

Organic farming systems, components of organic horticultural systems, different organic inputs, their role in organic horticulture. Role of biofertilizers, biodynamics and the recent developments. EM technology and its impact in organic horticulture, indigenous practices of organic farming, sustainable soil fertility management. Weed management practices in organic farming, biological/natural control of pests and diseases, organic horticulture in quality improvement. Certification of organic products and systems, agencies involved at national and international levels, standards evolved by different agencies

Practical

1. Designs of greenhouse, low cost poly tunnels, nethouse.
-

2. Regulation of light, temperature, humidity in greenhouses.
3. Media.
4. Greenhouse cooling systems.
5. Ventilation systems.
6. Fertigation systems.
7. Project preparation for greenhouses.
8. Visit to greenhouses.
9. Biofertilizers and their application.
10. Panchagavya preparation.
11. Methods of preparation of compost.
12. Vermicompost.
13. Green manuring.
14. Preparation of neem products and application.
15. Biological/natural control of pests and diseases.
16. Soil solarization.
17. Documentation for certification.
18. Visit to fields cultivated under organic practices.

Suggested Readings:

1. Okaldrich RA & Bartok JW. 1994. *Green House Engineering*. NRAES,
 2. Riley, Robb Hall, Cornell University, Ithaca, New York.
 3. Bhattacharjee BS. 1959. *Rose Growing in Tropics*. Thackarspink & Co.
 4. Laurie A, Kiplingr DD & Nelson KS. 1968. *Commercial Flower Forcing*. McGraw Hill.
 5. Mears DR, Kim MK & Roberts WJ. 1971. Structural Analysis at an Experimental Cable-supported Air Inflated Green Houses. Trans.ASAE.
 6. Pant V Nelson. 1991. *Green House Operation and Management*. Bali Publ.
 7. Pradeepkumar T, Suma B, Jyothibhaskar & Satheesan KN. 2007. *Management of Horticultural Crops*. Parts I, II. New India Publ. Agency.
 8. Claude A, Vandana S, Sultan I, Vijaya L, Korah M & Bernard D. 2000. *The Organic Farming Reader*. Other Indian Press, Goa.
 9. Gaur AC, Neblakantan S & Dargan KS. 1984 *Organic Manures*. ICAR.
 10. Lampkin N & Ipswich. 1990. *Organic Farming*. Farming Press. London.
 11. Lampkin NH & Padel S. 1992. *The Economics of Organic Farming – An International Perspective*. CABI.
-

12. Palaniappan & Annadurai. 2008. *Organic Farming- Theory and Practise*. Scientific Publ.
13. Peter KV. 2008. (Ed.). *Basics of Horticulture*. New India Publ. Agency. New Delhi.
14. Rao S. 1977. *Soil Microorganism and Plant Growth*. Oxford & IBH.

