MATA GUJRI COLLEGE

FATEHGARH SAHIB

(AN AUTONOMOUS COLLEGE)

RE-ACCEREDITED BY NAAC WITH "A" GRADE

"COLLEGE WITH POTENTIAL FOR EXCELLENCE" STATUS BY UGC

SYLLABI

SESSION: (2018-19, 2019-20)

FACULTY OF LIFE SCIENCE

DEPPARTMENT OF AGRICULTURE

COURSE: MASTER OF SCIENCE AGRICULTURE

(FRUIT SCIENCE)

Outline of the Syllabus for Semester-I

M.Sc. Agriculture (Horticulture- Fruit Science)

Semester-I

Paper Code	Subject	Credit hrs		Marks		External Assessment		Internal Assessment		Grand Total
		Theory	Practical	Theory	Practical	Theory	Practical	Theory	Practical	
FSC 501	Tropical Fruits	3	1	75	25	45	25	30	00	100
FSC 502	Subtropical Fruits	3	1	75	25	45	25	30	00	100
STAT-501	Statistical Methods	3	1	75	25	45	25	30	00	100
ENG 501	English (communication skills)	3	0	100	00	60	00	40	00	100
SOILS- 502	Soil fertility and fertilizer use	3	1	75	25	45	25	30	00	100
Total		15	04	400	100	240	100	160	00	500

***One credit hour of Practical= 2 hours**
***One credit hour of Theory= 1 hour**
***One credit hour of Master Research= 1 hour**

FRUIT SCIENCE

FSC 501 TROPICAL FRUITS

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

To impart basic knowledge about the importance and management of tropical fruits grown in India.

Theory

UNIT- I

Importance, history, origin, area, distribution, botany, taxonomy, varieties and their classification. Climatic and soil requirements, propagation, root stocks and problem of multiplication. Establishment of commercial orchards, planting and aftercare. Nutrition management, nutritional disorders, training, pruning, irrigation, weed control and intercropping. Vegetative and reproductive phases, fruit set and fruiting. Techniques for high productivity, Physiological disorders causes and remedies, Pest, diseases and their management, Post-harvest handling. Industrial and export potential, Agri. Export Zones (AEZ) and industrial supports of the following crops:

1. **Mango, Banana**
2. **Papaya, Sapota**
3. **Pineapple, Jackfruit**
4. ***Annonacaeous* crops**

UNIT -II

Importance, history, origin, area, distribution, botany, taxonomy, varieties and their classification. Climatic and soil requirements, propagation, root stocks and problem of multiplication. Establishment of commercial orchards, planting and aftercare. Nutrition management, nutritional disorders, training, pruning, irrigation, weed control and intercropping. Vegetative and reproductive phases, fruit set and fruiting. Techniques for high productivity, Physiological disorders causes and remedies, Pest, diseases and their management, Post-harvest handling. Industrial and export potential, Agri. Export Zones (AEZ) and industrial supports of the following crops:

5. **Jamun, Tamarind**
6. **Avacado, Passion fruit**
7. **Mangosteen, Carambola**
8. **Bilimbi**

Practical

1. Study of varieties and species of tropical fruits
2. Propagation methods of tropical fruits
3. Planting and after care of tropical fruits
4. Nutrient diagnosis of tropical fruits
5. Study of flowering and fruit set of tropical fruits
6. Identification of pests and diseases and their management of tropical fruits
7. Harvesting and handling of tropical fruits
8. Project preparation for establishment of commercial orchards of tropical fruits
9. Visit to progressive orchards and research centre of tropical fruits

Suggested Readings:

1. Bose TK, Mitra SK & Rathore DS. (Eds.). 1988. *Temperate Fruits -Horticulture*. Allied Publ.
2. Bose TK, Mitra SK & Sanyal D. 2001. (Eds.). *Fruits -Tropical and Subtropical*. NayaUdyog.
3. Chadha KL &Pareek OP. 1996. (Eds.). *Advances in Horticulture*. Vols. IIIV. Malhotra Publ. House.
4. Nakasone HY & Paul RE. 1998. *Tropical Fruits*. CABI.

5. Peter KV. 2008. (Ed.). *Basics of Horticulture*. New India Publ. Agency.
6. Pradeep kumar T, Suma B, Jyothibhaskar&Satheesan KN. 2008.*Management of Horticultural Crops*. Parts I, II. New India Publ. Agency.
7. Radha T & Mathew L. 2007. *Fruit Crops*. New India Publ. Agency.
8. Singh HP, Negi JP & Samuel JC. (Eds.). 2002. *Approaches for Sustainable Development of Horticulture*. National Horticultural Board.
9. Singh HP, Singh G, Samuel JC & Pathak RK. (Eds.). 2003. *Precision Farming in Horticulture*. NCPAH, DAC/PFDC, CISH, Lucknow.

FSC 502 SUBTROPICAL FRUITS

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 carrying9 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

To impart basic knowledge about the importance and management of subtropical fruits grown in India.

Theory

UNIT- I

Importance, history, origin, area, distribution, botany, taxonomy, varieties and their classification. Climatic and soil requirements, propagation, root stocks and problem of multiplication. Establishment of commercial orchards, planting and aftercare. Nutrition management, nutritional disorders, training, pruning, irrigation, weed control and intercropping. Vegetative and reproductive phases, fruit set and fruiting. Techniques for high productivity, Physiological disorders causes and remedies, Pest, diseases and their management, Postharvest handling. Industrial and export potential, Agri. Export Zones (AEZ) and industrial supports of the following crops.

1. **Citrus**
2. **Grapes**
3. **Guava**
4. **Pomegranate, Fig**

UNIT- II

Importance, history, origin, area, distribution, botany, taxonomy, varieties and their classification. Climatic and soil requirements, propagation, root stocks and problem of multiplication. Establishment of commercial orchards, planting and aftercare. Nutrition

management, nutritional disorders, training, pruning, irrigation, weed control and intercropping. Vegetative and reproductive phases, fruit set and fruiting. Techniques for high productivity, Physiological disorders causes and remedies, Pest, diseases and their management, Postharvest handling. Industrial and export potential, Agri. Export Zones (AEZ)and industrial supports of the following crops

5. **Ber**
6. **Aonla**
7. **Litchi**
8. **Date palm, West Indian cherry**

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Practical

1. Study of varieties and species of sub-tropical fruits
2. Propagation methods of sub-tropical fruits
3. Planting and aftercare of sub-tropical fruits
4. Nutrient diagnosis of sub-tropical fruits
5. Study of flowering and fruit set of sub-tropical fruits
6. Identification of pests and diseases and their management of sub-tropical fruits
7. Harvesting and handling of sub-tropical fruits
8. Project preparation for establishment of commercial orchards of sub-tropical fruits
9. Visit to progressive orchards and research centre of sub-tropical fruits

Suggested Readings:

1. Bose TK, Mitra SK & Rathore DS. (Eds.). 1988. *Temperate Fruits -Horticulture*. Allied Publ.
2. Bose TK, Mitra SK & Sanyal D. 2001. (Eds.). *Fruits -Tropical and Subtropical*. NayaUdyog.
3. Chadha KL &Pareek OP. 1996. (Eds.). *Advances in Horticulture*. Vols. IIIV. Malhotra Publ. House.
4. Nakasone HY & Paul RE. 1998. *Tropical Fruits*. CABI.
5. Peter KV. 2008. (Ed.). *Basics of Horticulture*. New India Publ. Agency.
6. Pradeep kumar T, Suma B, Jyothibhaskar&Satheesan KN. 2008.*Management of Horticultural Crops*. Parts I, II. New India Publ. Agency.

7. Radha T & Mathew L. 2007. *Fruit Crops*. New India Publ. Agency.
8. Singh HP, Negi JP & Samuel JC. (Eds.). 2002. *Approaches for Sustainable Development of Horticulture*. National Horticultural Board.
9. Singh HP, Singh G, Samuel JC & Pathak RK. (Eds.). 2003. *Precision Farming in Horticulture*. NCPAH, DAC/PFDC, CISH, Lucknow.

Outline of the Syllabus for Semester-II

M.Sc. Agriculture (Horticulture- Fruit Science)

Semester-II

Paper Code	Subject	Credit hrs		Marks		External Assessment		Internal Assessment		Grand Total
		Theory	Practical	Theory	Practical	Theory	Practical	Theory	Practical	
FSC 503	Temperate Fruits and Nuts	3	1	75	25	45	25	30	00	100
FSC 505	Propagation and Nursery Management for Fruit Crops	3	1	75	25	45	25	30	00	100
FSC 506	Breeding of Fruit Crops	3	1	75	25	45	25	30	00	100
FSC 508	Growth and Development of Horticultural Crops	3	1	75	25	45	25	30	00	100
STAT-502	Experimental Design	2	1	75	25	45	25	30	00	100
COMP-501	Introduction to Information Technology	2	1	75	25	45	25	30	00	100
Total		16	06	450	150	270	150	180	00	600

***One credit hour of Practical= 2 hours**
***One credit hour of Theory= 1 hour**
***One credit hour of Master Research= 1 hour**

FSC 503 TEMPERATE FRUITS AND NUT

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 carrying9 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

To impart basic knowledge about the importance and management of temperate fruits and nuts grown in India.

Theory

Unit-I

Importance, history, origin, area, distribution, botany, taxonomy, varieties and their classification. Climatic and soil requirements, propagation, root stocks and problem of multiplication. Establishment of commercial orchards, planting and aftercare. Nutrition management, nutritional disorders, training, pruning, irrigation, weed control and intercropping. Vegetative and reproductive phases, fruit set and fruiting. Techniques for high productivity, Physiological disorders causes and remedies, Pest, diseases and their management, Post-harvest handling. Visit to orchards / research centre of the following fruit crops

1. **Apple, Pear**
2. **Peach**
3. **Plum**
4. **Cherries, Strawberry**

Unit - II

Importance, history, origin, area, distribution, botany, taxonomy, varieties and their classification. Climatic and soil requirements, propagation, root stocks and problem of multiplication. Establishment of commercial orchards, planting and aftercare. Nutrition management, nutritional disorders, training, pruning, irrigation, weed control and intercropping.

Vegetative and reproductive phases, fruit set and fruiting. Techniques for high productivity, Physiological disorders causes and remedies, Pest, diseases and their management, Post-harvest handling. Visit to orchards / research centre of the following fruit crops

1. **Kiwifruit, Walnut**
2. **Almond, Apricot**
3. **Pecan nut**
4. **Pistachio nut**

Practical

1. Study of varieties and species of temperate fruits
2. Propagation methods of temperate fruits
3. Planting and aftercare of temperate fruits
4. Nutrient diagnosis of temperate fruits
5. Study of flowering and fruit set of temperate fruits
6. Identification of pests and diseases and their management of temperate fruits
7. Harvesting and handling of temperate fruits
8. Project preparation for establishment of commercial orchards of temperate fruits
9. Visit to progressive orchards and research centre of temperate fruits

Suggested Readings:

1. Mitra, S.K., Rathore D.S., and Bose, T.K.991, Temperate fruits, Horticultureand Aallied Publishers, Kolkatta
2. Chadha, K.L. And Pareek, D.P., 1993, Advances in Horticulture, Vol. II & III,Malhotra Publishing House New Delhi
3. Singh Amar, 1980. Fruit Physiology and Production, Kalyani Publishers, NewDelhi.
4. Chattopadhyay, T.K. (ed) (1998) A Textbook on Pomology vol. II & III, Kalyani Publishers, Calcutta.

FSC 505 PROPAGATION AND NURSERY MANAGEMENT FOR FRUIT 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 carrying9 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

Familiarization with principles and practices of propagation and nursery management for fruit crops.

Theory

Unit-I

1. Introduction, life cycles in plants, cellular basis for propagation, sexual propagation, apomixes, polyembryony, chimeras.
2. Principles factors influencing seed germination of horticultural crops, dormancy, hormonal regulation of germination and seedling growth. Seed quality, treatment, packing, storage, certification, testing.
3. Asexual propagation – rooting of soft and hard wood cutting under mist by growth regulators.
4. Rooting of cuttings in hotbeds. Physiological, anatomical and biochemical aspects of root induction in cuttings. Layering – principle and methods.

Unit-II

1. Budding and grafting – selection of elite mother plants, methods. Establishment of bud wood bank. Stock, scion and inter stock, relationship.
2. Incompatibility. Rejuvenation through top working – Progeny orchard and scion bank.
3. Micro-propagation – principles and concepts, commercial exploitation in horticultural crops. Techniques - *in vitro* clonal propagation, direct organogenesis,

embryogenesis, micro grafting, Meristem culture. Hardening, packing and transport of micro-propagules.

4. Nursery – types, structures, components, planning and layout. Nursery management practices for healthy propagule production.

Practical

1. Anatomical studies of rooting of cuttings and graft unions
2. Construction of propagation structures
3. Study of media and PGR. Hardening – case studies
4. Micro propagation, explants preparation, media preparation, culturing –*invitro*clonal propagation,
5. Meristem culture
6. Shoot tip culture
7. Axillary bud culture
8. Direct organogenesis
9. Direct and indirect embryogenesis, micro grafting, hardening.
10. Visit to TC labs and nurseries.

Suggested Readings:

1. Hartmann HT & Kester DE. 1989. *Plant Propagation – Principles and Practices*. Prentice Hall of India.
2. Bose TK, Mitra SK & Sadhu MK. 1991. *Propagation of Tropical and Subtropical Horticultural Crops*. NayaProkash.
3. Peter KV. (Ed.). 2008. *Basics of Horticulture*. New India Publ. Agency.
4. Singh SP. 1989 *Mist Propagation*. Metropolitan Book Co.
5. Rajan S & Baby LM. 2007. *Propagation of Horticultural Crops*. New India Publ. Agency.
6. Radha T & Mathew L. 2007. *Fruit Crops*. New India Publ. Agency.

FSC 506 BREEDING OF FRUIT 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 carrying9 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

To impart comprehensive knowledge about the principles and practices of breeding of fruit crops.

Theory

Unit-I

1. Origin and distribution, taxonomical status - species and cultivars, cytogenetics, genetic resources, blossom biology
2. Breeding systems, breeding objectives, ideotypes, approaches for crop improvement -introduction, selection, hybridization, mutation breeding, polyploidy breeding, rootstock breeding, improvement of quality traits
3. Resistance breeding for biotic and abiotic stresses,
4. Biotechnological interventions, achievements and future thrust in the following selected fruit crops: **Mango, banana and pineapple, Citrus, grapes, guava and sapota, Jackfruit, papaya, custard apple, aonla**.

Unit-II

1. Origin and distribution, taxonomical status - species and cultivars, cytogenetics, genetic resources, blossom biology
2. Breeding systems, breeding objectives, ideotypes, approaches for crop improvement -introduction, selection, hybridization, mutation breeding, polyploidy breeding, rootstock breeding, improvement of quality traits
3. Resistance breeding for biotic and abiotic stresses

4. Biotechnological interventions, achievements and future thrust in the following selected fruit crops. **Avocado, ber, Mangosteen, litchi, jamun, phalsa, mulberry, raspberry, kokam and nuts, Apple, pear, plums, peach, apricot, cherries and strawberry**

Practical

1. Characterization of germplasm, blossom biology
2. Study of anthesis,
3. Estimating fertility status,
4. Practices in hybridization,
5. Ploidy breeding, mutation breeding,
6. Evaluation of biometrical traits and quality traits,
7. Screening for resistance, developing breeding programme for specific traits,
8. Visit to research stations working on tropical, subtropical and temperate fruit improvement

Suggested Readings:

1. Bose TK, Mitra SK &Sanyol D. (Eds.). 2002. *Fruits of India – Tropical and Sub tropical*. 3rd Ed. Vols. I, II. NayaUdyog.
2. Chadha KL &Pareek OP. 1996. (Eds.). *Advances in Horticulture*. Vol. I. Malhotra Publ. House.
3. Chadha KL &Shikhamany SD. 1999. *The Grape: Improvement, Production and Post-Harvest Management*. Malhotra Publ. House.
4. Janick J & Moore JN. 1996. *Fruit Breeding*. Vols.I-III. John Wiley & Sons.
5. Nijjar GS. 1977. (Eds.). *Fruit Breeding in India*. Oxford & IBH.
6. Radha T & Mathew L. 2007. *Fruit Crops*. New India Publ. Agency.
7. Singh S, Shivankar VJ, Srivastava AK & Singh IP. (Eds.). 2004. *AdvancesinCitriculture*. Jagmander Book Agency.

FSC 508-GROWTH AND DEVELOPMENT OF HORTICULTURALCROPS

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 carrying9 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

To develop understanding of growth and development of horticultural crops which have implications in their management?

Theory

Unit-I

1. Growth and development- definition, parameters of growth and development, growth dynamics, morphogenesis.
2. Annual, semi-perennial and perennial horticultural crops. Environmental impact on growth and development, effect of light, photosynthesis and photoperiodism, vernalisation, effect of temperature, heat units, thermoperiodism.
3. Assimilate partitioning during growth and development, influence of water and mineral nutrition during growth and development
4. Biosynthesis of auxins, gibberellins, cytokinins, abscissic acid, ethylene, brasssinosteroids, growth inhibitors, morphactins, role of plant growth promoters and inhibitors.

Unit-II

1. Developmental physiology and biochemistry during dormancy, bud break, juvenility, vegetative to reproductive interphase, flowering, pollination, fertilization and fruit set
2. Fruit drop, fruit growth, ripening and seed development.
3. Growth and developmental process during stress - manipulation of growth and development

4. Impact of pruning and training, chemical manipulations in horticultural crops, molecular and genetic approaches in plant growth development.

Practical

1. Understanding dormancy mechanisms in seeds, tubers and bulbs and stratification of seeds, tubers and bulbs
2. Visit to arid, subtropical and temperate horticultural zones to identify growth and development patterns, techniques of growth analysis
3. Evaluation of photosynthetic efficiency under different environments
4. Study of growth regulator functions, hormone assays
5. Understanding ripening phenomenon in fruits and vegetables
6. Study of impact of physical manipulations on growth and development, study of chemical manipulations on growth and development, understanding stress impact on growth and development.

Suggested Readings:

1. Buchanan B, Gruiessam W & Jones R. 2002. *Biochemistry & Molecular Biology of Plants*. John Wiley & Sons.
2. Epstein E. 1972. *Mineral Nutrition of Plants: Principles and Perspectives*. Wiley.
3. Fosket DE. 1994. *Plant Growth and Development: a Molecular Approach*. Academic Press.
4. Leoplod AC &Kriedermann PE. 1985. *Plant Growth and Development*. 3rdEd. Mc Graw-Hill.
5. Peter KV. 2008. (Ed.) *Basics of Horticulture*. New India Publ. Agency.
6. Roberts J, Downs S & Parker P. 2002. Plant Growth Development. In: *Plants* (I.
7. Ridge, Ed.), pp. 221-274, Oxford University Press.
8. Salisbury FB & Ross CW. 1992. *Plant Physiology*. 4th Ed. Wadsworth Publ.