Semester 1st		Contact Hours			Max Marks		Total Marks	Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.		
MHRTS1-101	Tropical and Dry land fruit Production	2	-	-	40	60	100	2
MHRTS1-102	Sub-tropical and Temperate Fruit Production	2	-	-	40	60	100	2
MHRTS1-103	Nutrient and Canopy Management in Fruit Crops	2	-	-	40	60	100	2
MHRTS1-104	Technical Writing and Communication Skills, Library and Information Services	2	-	-	40	60	100	2
MHRTS1-105	Intellectual Property Management, Biodiversity and Biosafety	2	-	-	40	60	100	2
MHRTS1-106	Tropical and Dry land fruit Production lab	-	-	2	60	40	100	1
MHRTS1-107	Sub-tropical and Temperate Fruit Production lab	-	-	2	60	40	100	1
MHRTS1-108	Nutrient and Canopy Management in Fruit Crops lab	-	-	2	60	40	100	1
MHRTS1-109	Technical Writing and Communication Skills, Library and Information Services lab	-	-	2	60	40	100	1
MHRTS1-110	Master's research	-	-	4	-	-	-	2
Total		10		12	440	460	900	16

Semester 2nd		Contact Hours			Max Marks		Total Marks	Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.		
MHRTS1-201	Principles and Practices of Plant Propagation	2	-	-	40	60	100	2
MHRTS1-202	Breeding of Fruit Crops	2	-	-	40	60	100	2
MHRTS1-203	Statistical Methods for Research Workers	2	-	-	40	60	100	2
MHRTS1-204	Soil Fertility and Fertilizer Use	2	-	-	40	60	100	2
MHRTS1-205	Principles and Practices of Plant Propagation lab	-	-	2	60	40	100	1
MHRTS1-206	Breeding of Fruit Crops lab	-	-	2	60	40	100	1
MHRTS1-207	Statistical Methods for Research Workers lab	-	-	2	60	40	100	1
MHRTS1-208	Soil Fertility and Fertilizer Use lab	-	-	2	60	40	100	1
MHRTS1-209	Master's research	-	-	12	-	-	-	6
Total		8		20	400	400	800	18

Semester 3rd		Contact Hours			Max Marks		Total Marks	Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.		
MHRTS1-301	Growth and Development of Horticultural Crops	2	-	-	40	60	100	2
MHRTS1-302	Orchard Management and Organic Horticulture	2	-	-	40	60	100	2
MHRTS1-303	Analytical Techniques and Instrumental Methods in Soil and Plant Analysis	2	-	-	40	60	100	2
MHRTS1-304	Management of Problem Soils and Water	2	-	-	40	60	100	2
MHRTS1-305	Growth and Development of Horticultural Crops (practical)	-	-	2	40	60	100	1
MHRTS1-306	Orchard Management and Organic Horticulture(practical)	-	-	2	40	60	100	1
MHRTS1-307	Analytical Techniques and Instrumental Methods in Soil and Plant Analysis(practical)	-	-	2	60	40	100	1
MHRTS1-308	Management of Problem Soils and Water(practical)	-	-	2	60	40	100	1
MHRTS1-309	Master's research	-	-	12	-	-	-	6
Total		8		20	360	440	800	18

Semester 4th		Contact Hours			Max Marks		Total Marks	Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.		
MHRTS1-401	Master Seminar	-	-	-	100	100	200	3
MHRTS1-402	Research and Publication Ethics	1	-	-	40	60	100	1
MHRTS1-403	Research and Publication Ethics (practical)	-	-	2	60	40	100	1
MHRTS1-404	Master's research	-	-	22	-	-	-	11
	Total	1	-	24	200	200	400	16

Overall Marks / Credits

Semester	Marks	Credits
1st	900	16
2nd	800	18
3rd	800	18
4th	400	16
Total	2900	68

TROPICAL AND DRYLAND FRUIT PRODUCTION

Subject Code: MHRTS1-101 **L T P C** **Duration:30(Hrs.)**

2 0 0 2

Course Objectives:

1. To impart basic knowledge about the importance and management of Tropical and dry land fruits grown in India.
2. To know the concept of IPM and recognizing the physiological disorders of fruit plants.
3. To Impart knowledge about inflorescence, pollination and fruit bearing in orchard.

Course Outcomes:

1. Students will learn about the importance and management of tropical and dry land fruits.
2. To provide knowledge about IPM, diseases and others physiological disorders effecting fruit production.
3. Provide knowledge about flowering, pollination and fruit setting in fruit crops.

Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			2									
CO2		2										
CO3			2									

UNIT-I (7Hrs)

Origin, distribution, commercial importance and export potential. Eco physiological requirements.

UNIT-II (7Hrs)

Species and varieties. Rootstocks and propagation. Planting, root zone, training and pruning. Nutrition and water requirements, fertigation, role of bio- regulators,

UNIT-III (8Hrs)

Major pests, diseases, physiological disorders and their control measures. Abiotic factors limiting fruit production. Flowering, pollination and fruit set. Quality improvement. Storage and ripening techniques.

UNIT-IV (8Hrs)

Industrial and export potential, Agri. Export Zones (AEZ) and industrial support. Fruit crops- citrus, mango, papaya, pineapple, banana, avocado, sapota, guava, ber, amla, Jack fruit, annonas and minor fruits of tropics.

Recommended Text Books / Reference Books:

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. Naya Udyog. • 3. Chadha KL & Pareek OP. 1996 (Eds.). Advances in Horticulture. Vols. IIIV Mallotra Publ. House.
3. Nakasone HY & Paul RE. 1998. Tropical Fruits. CABI. • Peter KV. 2008 (Ed.). Basis of Horticulture. New India Publ. Agency.
4. Pradeep Kumar T, Suma B, Jyothibhaskar & Satheesan KN. 2008. Management of Horticultural Crops. Parts I, II. New India Publ. Agency.
5. Radha T & Mathew L. 2007. Fruit Crops. New India Publ. Agency.
6. Singh HP, Negi JP & Samuel JC. (Eds.) 2002. Approaches for Sustainable Development of Horticulture. National Horticulture Board.
7. Singh HP, Singh G, Samuel JC & Pathak RK. (Eds.). 2003. Precision Farming in Horticulture. NCPAH, DAC/PFDC, CISH, Lucknow. 12

SUB-TROPICAL AND TEMPERATE FRUIT PRODUCTION

Subject Code: MHRTS1-102 **L T P C** **Duration:30 (Hrs.)**

2 0 0 2

Course Objectives:

1. To provide basic knowledge about the importance and management of sub-tropical and temperate fruits grown in India.
2. To provide knowledge about IPM, diseases and others physiological disorders effecting fruit production.
3. Provide knowledge about the propagation techniques, planting system, cropping, root zone and canopy management in fruit crops.

Course Outcomes:

1. Students will learn about the importance and management of sub- tropical and temperate fruits.
2. To provide knowledge about IPM, diseases and others physiological disorders effecting fruit production
3. To gain knowledge about the recent trends in propagation, rootstock influence, planting system, cropping systems, root zone and canopy management.

Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			2									
CO2		2										
CO3					2							

UNIT-1(8 Hours)

Origin, distribution, commercial importance and export potential. Ecophysiological requirements. Species and varieties. Rootstocks and propagation.

UNIT-II (8 Hours)

Planting, root zone, training and pruning. Nutrition and water requirements, fertigation,

role of bio- regulators, major pests, diseases, physiological disorders and their control measures.

UNIT-III (7 Hours)

Abiotic factors limiting fruit production. Flowering, pollination and fruit set. Quality improvement. Storage and ripening techniques. Industrial and export potential, Agri. Export Zones (AEZ) and industrial support.

UNIT-IV (7 Hours)

Fruit crops- Apple, pear, quince, grapes, plum, peach, apricot, cherries, hazelnut, litchi, loquat, persimmon, kiwifruit, strawberry, walnut, almond, pistachio, pecan, mangosteen, carambola, bael, wood apple, fig, jamun, rambutan and pomegranate.

Recommended Text Books / Reference Books:

1. Chadha KL & Shikhamany SD. 1999. The Grape : Improvement, Production and Post- Harvest Management. Malhotra Publ. House.
2. Janick J & Moore JN. 1996. Fruit Breeding. Vols. I-III. John Wiley & Sons.
3. Nijjar GS, 1977 (Eds.). Fruit Breeding in India. Oxford & IBH.
4. Radha T & Mathew L. 2007. Fruit Crops. New India Publ. Agency.
5. Singh S, Shivankar VJ, Srivastava AK & Singh IP. (Eds.). 2004. Advances in Citriculture. Jagmander Book Agency.

NUTRIENT AND CANOPY MANAGEMENT IN FRUIT CROPS

Subject Code: MHRTS1-103 **L T P C** **Duration:30(Hrs.)**

2 0 0 2

Course Objectives:

1. To impart nature, sources and criteria of essentiality nutrients in plants.
2. To know about the different training and pruning systems to give attractive shapes to the plant.
3. To know about land utilization and selection of planting material for propagation.

Course Outcomes:

1.Provide knowledge about the nature, sources and essentiality of plant nutrients.
2.To impart knowledge about the different training and pruning methods of fruit crops.
3. To gain knowledge about utilization of land and selection of planting material.

Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2											
CO2					2							
CO3		1										

UNIT-I (7Hrs)

Essential elements, criteria of essentiality. Natural sources and fertilizers. Role of essential elements in fruit plants. Interaction of nutrients.

UNIT-II (7Hrs)

Canopy management, importance and advantages. Factors affecting canopy development. Canopy types and structures. Light interception and distribution in different types of tree canopies.

UNIT-III (8Hrs)

Spacing and utilization of land area. Canopy management through the use of rootstock and scion, plant growth inhibitors, training and pruning and management practices.

UNIT-IV (8Hrs)

Canopy development in relation to growth, flowering, fruiting and fruit quality in temperate fruits, grapes, pomegranate, mango, sapota, guava, citrus and ber.

Recommended Text Books / Reference Books:

1. Chadha KL & Shikhamany SD. 1999. The Grape, Improvement, Production and Post Harvest Management. Malhotra Publ. House.
2. Pradeepkumar T, Suma B, Jyothibhaskar & Satheesan KN. 2008. Management of Horticultural Crops. New India Publ. Agency.
3. K K Srivastava (2007) *Canopy management in fruit crops.*

TECHNICAL WRITING AND COMMUNICATION SKILLS, LIBRARY AND INFORMATION SERVICE

Subject Code: MHRTS1-104 **L T P C** **Duration: 30 (Hrs.)**

2 0 0 2

Course Objectives:

1. To improve fluency in the language.
2. Able to speak English well.
3. Use English language while talking.

Course Outcomes:

1. Competency in communication both written and oral
2. The ability to speak English well.
3. Word power to effectively use the English language

Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										3		
CO2									2			

CO3										2		

UNIT-I (6 Hours)

Technical Writing-Various forms of technical writing-theses, technical papers, reviews ,electronic communication etc; qualities of technical writing

UNIT-II (8 Hours)

Parts of research communications- title page, content page, authorship, preface, introduction, review of literature, materials and methods, experimental results, documentation; photographs and drawings with suitable captions; pagination, citations; writing of abstracts; précis; synopsis

UNIT-III (8 Hours)

Editing and proof reading. Communication Skills-defining communication; types of communication- verbal and non-verbal; assertive communication; assertive communication; using language for effective communication;

UNIT-IV (8 Hours)

Techniques of dyadic communication- message pacing and message chunking, self-disclosure, mirroring, expressing conversational intent; paraphrasing; vocabulary building-word roots, prefixes, Greek and Latin roots.

Recommended Text Books / Reference Books:

1. Raman M and Sharma S (2015) Technical Communication Principles and Practice. *Oxford University Press, 3rd edition.*
2. Farhathullah T M (2017) *Communication Skill for Technical Students.* Sangam Books Ltd.

INTELLECTUAL PROPERTY MANAGEMENT, BIODIVERSITY AND BIOSAFETY

Subject Code: MHRTS1-105 **L T P C** **Duration: 30(Hrs.)**

2 0 0 2

Course Objectives:

1. To impart knowledge about the history, concepts and types, international treaties and conventions for protection of IP'S.
2. To know the role of intellectual property in growth, development, trade and commerce.
3. To impart knowledge about the different ecosystems and their sustainable uses.

Course Outcomes:

1. Students will learn about the history, concepts and types, international treaties and conventions for protection of IP'S.

2. To provide knowledge about the role of intellectual property in growth, development, trade and commerce.
3. Students will learn about the different ecosystems and their sustainable uses.

Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2											
CO2												1
CO3							2					

UNIT-I (7 Hours)

Introduction to Intellectual Property: history, concepts and types. International treaties and conventions for protection of IP'S. Role of intellectual property in growth, development, trade and commerce; Indian legislations for the protection of various types of Intellectual Property with a special reference to history and evolution of the concepts of geographical indicators, variety protection and patents.

UNIT-II (8 Hours)

R & D expenditure visà-vis patents. PPVFRA: Process for protection of plant varieties, issues related to compliance sand infringements. GI: Process for protection of goods, community involvement and benefit sharing. Patents: Search, process of filing patents, infringement and compliances. Biodiversity: Definition, importance, historical and geographical causes for diversity. Species and population biodiversity,

UNIT-III (8 Hours)

Maintenance of ecological biodiversity. Biodiversity hot spots in India, Collection, conservation, documentation and characterization of biodiversity, development and maintenance of live repositories, community gene banks. Convention on biological diversity. National biodiversity protection initiatives; sustainable use of bio-diversity, benefit sharing, Bio-safety guidelines for the development and protection of genetically modified organisms

UNIT-IV (7 Hours)

Cartagena Protocol of Bio-safety, its objective, salient features, risk assessment and risk management for GMO's, Bio-safety guidelines, rules and regulations and regulatory frame work for GMO in India; institutional arrangements at national level, procedure for direct use of GMO's in India. Licensing of technologies, Material transfer agreements, Research collaboration agreement, License Agreement.

Recommended Text Books / Reference Books:

1. Sibi G (2021) Intellectual Property Rights, Bioethics, Biosafety and Enterpreneurship in Biotechnology. *Dreamtech Press*.
2. Goel D and Parashar S (2013) IPR Biosafety and Bioethics.

TROPICAL AND DRYLAND FRUIT PRODUCTION LAB

Subject Code: MHRTS1-106 **L T P C** **Duration: 30 (Hrs.)**

0 0 2 1

Course Objectives:

1. To identify different species of fruit crops.
2. To impart knowledge about the nutrient management in fruit crops.
3. To know different methods of training and pruning to give attractive shape to the plants.

Course Outcomes:

1. Students will be able to identify the different species of fruit crops.
2. To provide knowledge about the nutrient management in fruit crops.
3. To impart knowledge about the different methods of training and pruning.

Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1											
CO2			2									
CO3			2									

PRACTICALS

1. Description and identification of species and varieties.
2. Observations on growth and development of tropical & dry land fruit crop.
3. Practices in growth regulation of tropical & dry land fruit crops.
4. Nutritional and physiological disorders and their control.
5. Rejuvenation of old and unproductive Trees
6. Visit to commercial orchards.
7. Project preparation for establishing commercial orchards.

SUB-TROPICAL AND TEMPERATE FRUIT PRODUCTION LAB

Subject Code: MHRTS1-107 **L T P C** **Duration: 30 (Hrs.)**

0 0 2 1

Course Objectives:

1. To identify the different plant species and varieties.
2. Impart knowledge about the Preparation of different planting material for establishment of orchard.
3. To assess the nutritional and physiological disorders and their prevention.

Course Outcomes:

1. The students will able to identify the different plant species and varieties.
2. Preparation of different planting material for establishment of orchard
3. To recognise the nutritional and physiological disorders and their control.

Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2											
CO2				2								
CO3			2									

PRACTICALS

1. Description and identification of species and varieties.
2. Observations on growth and development of sub-tropical & temperate fruit crop.
3. Practices in growth regulation of sub-tropical & temperate fruit crop.
4. Nutritional and physiological disorders and their control.
5. Rejuvenation of old and unproductive trees.
6. Visit to commercial orchards.
7. Project preparation for establishing commercial orchards.

NUTRIENT AND CANOPY MANAGEMENT IN FRUIT CROPS LAB

Subject Code: MHRTS1-108 **L T P C** **Duration: 30 (Hrs.)**

0 0 2 1

Course Objectives:

1. Provide knowledge the different techniques of sampling.
2. To know about canopy management and geometry of plants.
3. Making varying sizes of plant samples to know nutrient status through analysis.

Course Outcomes:

1. Students will learn about the different techniques of sampling.
2. To get knowledge about the different canopy types and regulating geometry of plants.
3. Preparation of different sizes of plant samples to estimate nutrient status through analysis.

Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1					2							
CO2			1									
CO3		2										

PRACTICALS

1. Leaf sampling techniques

2. Determination of nutrient status through soil and plant analysis.
3. Study of different types of canopies.
4. Training of plants for different canopy types.
5. Canopy development through pruning, use of plant growth inhibitors and, geometry of planting.
6. Effect of canopy types on production and quality of fruits.

TECHNICAL WRITING AND COMMUNICATION SKILLS, LIBRARY AND INFORMATION SERVICES LAB

Subject Code: MHRTS1-109 **L T P C** **Duration: 30(Hrs.)**

0 0 2 1

Course Objectives:

1. Fluency both in written and oral.
2. Able to speak English well.
3. Use English language while talking.

Course Outcomes:

1. Competency in communication both written and oral
2. The ability to speak English well.
3. Word power to effectively use the English language.

Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										3		
CO2									2			
CO3										2		

PRACTICALS

1. Editing and Proof-reading technical articles using language tools for effective writing
2. Listening to audio-video conversations aimed at testing the comprehension of the students
3. Oral presentations on a given topic related to agriculture
4. Evaluation of body language and communication skills based on group discussions and interviews
5. Role plays and pronunciation exercises using eye contact and visual clues for effective listening skills
6. Word stress application and voice modulation
7. Soft skills; rhetoric skills; self-assessment exercises.
8. Introduction to Library and its services; Five laws oflibrary science; type of documents
9. Classification and cataloguing
10. Organization of documents
11. Sourcesof information-primary, secondary and tertiary
12. Current awareness and SDI services
13. Tracing informationfrom reference sources
14. Library survey
15. Preparation of bibliography
16. Use of Online Public AccessCatalogue
17. Use of CD-ROM databases and other computerized library services, CeRA, J-Gate
18. Use ofInternet including search engines and its resources; e-resources and access methods.