

P.G. DEPARTMENT OF AGRICULTURE

SYLLABUS

For

M.Sc. Ag. Horticulture (Fruit Science)

(Semester: I–IV)

Session: 2021-22

KHALSA COLLEGE AMRITSAR-143001

M.Sc. Ag. Horticulture (Fruit Science)

SEMESTER-I

Sr. No.	Course Code	Subject	Periods per week		Marks		Internal Assesment*	Grand Total
			Th.	Pract	Th.	Pract.		
1	FSC-511	Tropical Fruit Production and Dry Land Horticulture	4	3	75	37	38	150
2	FSC-512	Nutrient and Canopy Management in Fruit Crops	4	6	75	37	38	150
3	FSC-513	Systematic Pomology	4	3	75	37	38	150
4	TWC-514	Technical Writing and Communication Skills	2	0	50	-	-	50 (NC)
5	BCH-410/ PBG-410 (Minor)	Fundamentals of Biochemistry/ Principles of Plant Breeding	4	6	75	37	38	150
6.	STA-415	Statistical Methods for Research Workers	4	3	75	37	38	150
7.		Research Work (Synopsis)	-	2	-	-	-	--
	Total		22	23	375	185	190	750

*Total Internal Assessment to be given = 25% (House Test - 10%; Attendance - 10%; Conduct & Academic, Extra Curricular Activities - 5%).

M.Sc. Ag. Horticulture (Fruit Science)

SEMESTER-II

Sr. No	Course Code	Subject	Periods per week		Marks		Internal Assesment*	Grand Total
			Th.	Pract.	Th.	Pract.		
1	FSC-521	Sub Tropical and Temperate Fruit Production	4	3	75	37	38	150
2	FSC-522	Breeding of Fruit Crops	4	6	75	37	38	150
3	FSC-523	Post Harvest Technology of Fruit Crops	4	3	75	37	38	150
4	FSC-524/ FSH-524	Nursery Management of Horticultural Crops/ Growth and Development of Horticultural Crops	4	3	75	37	38	150
5	BCH-420/ PBG-420 (Minor)	Experiments in Biochemistry/ Breeding for Biotic and Abiotic Resistance	4	6	75	37	38	150
6	STA-425	Experimental Designs for Research Worker	4	3	75	37	38	150
7		Research Work (Synopsis)	-	2	-	-	-	--
Total			24	26	450	222	228	900

*Total Internal Assessment to be given = 25% (House Test - 10%; Attendance - 10%; Conduct & Academic, Extra Curricular Activities - 5%).

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SEMESTER-III

Sr. No.	Course Code	Subject	Periods per week		Marks		Internal Assesment*	Grand Total
			Th.	Prac	Th.	Prac		
1	FSC-531	Principles and Practices of Plant Propagation	4	3	75	37	38	150
2	FSC-532	Plant Growth Regulators in Fruit Crops	4	6	75	37	38	150
3	BCH-430/ PBG-430 (Minor)	Fundamentals of Nutritional Biochemistry/ Maintenance Breeding and Seed Production	4	3	75	37	38	150
4		Credit seminar	3	--	100	--	--	100
5		Research Work (Thesis)	-	4	--	--	--	--
Total			15	16	325	111	118	550

*Total Internal Assessment to be given = 25% (House Test - 10%; Attendance - 10%; Conduct & Academic, Extra Curricular Activities - 5%).

M.Sc. Ag. Horticulture (Fruit Science)

SEMESTER-IV

Sr. No.	Course Code	Subject	Periods per week		Marks		Internal Assessment*	Grand Total
			Th.	Pract.	Th.	Pract.		
1	FSC-541	Citriculture	4	3	50	25	25	100
2.	FSC-542	Orchard Floor Management and Organic Agriculture	4	3	50	25	25	100
3		Research Work (Thesis)	--	4	--	--	--	S/US
		Total	08	10	100	50	50	200

*Total Internal Assessment to be given = 25% (House Test - 10%; Attendance - 10%; Conduct & Academic, Extra Curricular Activities - 5%).

M.Sc. Ag. Horticulture (Fruit Science)

SEMESTER-I

FSC-511: Tropical Fruit Production and Dry Land Horticulture

Time: 3 Hours

Max. Marks: 150

Theory: 75

Practical: 37

Internal assessment: 38

Periods per week: 04+3

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. In all nine questions should be asked, of which first question of 15 marks (Comprising of 10 short answer type questions covering the whole syllabus) will be compulsory.
4. Out of remaining eight questions, two questions should be asked from each section, out of which the candidates are required to attempt one question from each section. All questions will carry equal marks (15).

Theory

Origin, Distribution, Commercial Importance and Export Potential. Ecophysiological Requirements. Species and Varieties. Rootstocks and Propagation. Planting, Root Zone, Training and Pruning. Nutrition and Water Requirements, Fertigation, Role of Bio-regulators, 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. Industrial and Export potential, Agri. Export Zones (AEZ) and Industrial Support. Fruit Crops-

Section-A: Citrus, Mango, Papaya, Pineapple, Banana,

Section-B: Avocado, Sapota, Guava, Ber, Pomegranate,

Section-C: Aonla, Jack Fruit, Annonas, Minor Fruits of Tropics.

Section-D: Possibilities and Constraints in Dry Land Fruit Production, Fruits suitable for Dry Land Horticulture.

Practical:

Description and Identification of Species and Varieties. Growth and Development. Growth Regulation. Nutritional and Physiological Disorders and their Control. Rejuvenation of Old and Unproductive Trees. Visit to Commercial Orchards. Project Preparation for Establishing Commercial Orchards.

M.Sc. Ag. Horticulture (Fruit Science)

SEMESTER-I

FSC-512
Time: 3 Hours

Nutrient and Canopy Management in Fruit Crops

Max. Marks: 150
Theory: 75
Practical: 37
Internal assessment: 38
Periods per week: 04+6

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. In all nine questions should be asked, of which first question of 15 marks (Comprising of short answer type questions covering the whole syllabus) will be compulsory.
4. Out of remaining eight questions, two questions should be asked from each section, out of which the candidates are required to attempt one question from each section. All question will carry equal marks (15).

Theory

Section-A: Essential elements, Criteria of essentiality. Natural sources and fertilizers. Role of essential elements in fruit plants. Interaction of nutrients.

Section-B: Canopy management, Importance and advantages. Factors affecting canopy development. Canopy types and structures.

Section-C: Light interception and distribution in different types of tree canopies. Spacing and utilization of land area. Canopy management through the use of rootstock and scion, plant growth inhibitors, training and pruning and management practices.

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

Practical:

Time: 3 Hours

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

M.Sc. Ag. Horticulture (Fruit Science)

SEMESTER-I

FSC-513

Systematic Pomology

Time: 3 Hours

Max. Marks: 150

Theory: 75

Practical: 37

Internal assessment: 38

Periods per week: 04+3

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. In all nine questions should be asked, of which first question of 15 marks (Comprising of 10 short answer type questions covering the whole syllabus) will be compulsory.
4. Out of remaining eight questions, two questions should be asked from each section, out of which the candidates are required to attempt one question from each section. All question will carry equal marks (15).

Theory

Section-A: Plant Taxonomy, Systematic pomology, its significance, systems of classification, history of systematic Pomology.

Section-B: Nomenclature and code of nomenclature, naming of fruit varieties, Speciation and classification of temperate, tropical and sub-tropical fruit plant species.

Section-C: Pomological description of temperate fruits (pear, apple, peach, plum, apricot, cherry, kiwi fruit, strawberry),

Section-D: Citrus fruits and other major fruits (mango, guava, grapes, pomegranate, date, ber, litchi, loquat, papaya, jamun, cashewnut, banana, aonla, sapota, phalsa and cape gooseberry).

Practical:

Time: 3 Hours

Vegetative and floral morphology of fruit plants. Description and identification of pome, stone, citrus and other major fruits (mango, guava, grapes, pomegranate, date, ber, etc etc.) Preparation and use of keys for the identification of fruit plant species and varieties. Visit to the fruit research stations for identification of different fruit species.

M.Sc. Ag. Horticulture (Fruit Science)

SEMESTER-I

TWC-514

Technical Writing and Communication Skills

Time:-3 hours

Max. Marks: 50

Theory Marks: 37

Internal Assessment: 13

Periods per week: 02+0

Instructions for the Paper Setters:

- 1) The question paper will consist of seven skill-oriented questions.
- 2) The first 6 Questions carry 5 marks each. There will be internal choice wherever possible
(6x5=30 Marks).
- 3) There will be one essay type question out of two parts of the course. The student has to attempt any one of the two in about 150 words (1x7=7 Marks)

Course Contents:

1. **Technical Writing**-Various forms of technical writing-theses, technical papers, reviews, electronic communication etc; qualities of technical writing; 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; editing and proof reading.
2. **Communication Skills**-defining communication; types of communication- verbal and non-verbal; assertive communication; using language for effective communication; paraphrasing; vocabulary building- word roots, prefixes.

Recommended Books:

1. *Oxford Guide to Effective Writing and Speaking* by John Seely.
2. *The Written Word* by Vandana R Singh, Oxford University Press

M.Sc. Ag. Horticulture (Fruit Science)

SEMESTER-I

BCH-410

Fundamentals of Biochemistry(Minor)

Time: 3 Hours

Max. Marks: 150

Theory: 75

Practical: 37

Internal assessment: 38

Periods per week: 04+06

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. In all nine questions should be asked, of which first question of 15 marks(Comprising of 10 short answer type questions covering the whole syllabus) will be compulsory.
4. Out of remaining eight questions, two questions should be asked from each section, out of which the candidates are required to attempt one question from each section. All question will carry equal marks (15).

Theory:

Section-A: Cell structure and function. Structure and role of water in biological system. Acids, bases and buffers of living systems.

Section-B: The pK of biomolecules. Classification of enzymes. Effect of substrate, temperature, pH, activators and inhibitors on enzyme catalysis. Vitamins and hormones.

Section-C: Bio- membranes structure and function. Bioenergetics and oxidative phosphorylation. Metabolism of carbohydrates, lipids, proteins, nucleic acids. Photosynthesis and respiration.

Section-D: DNA replication, transcription and translation. Regulation of transcription. Recombinant DNA technology. Secondary plant products.

Practical: Study of cell structure and its functions. Preparation of buffer solutions. Calculation of pH. Study of enzymes. Enzyme extraction. Study of vitamins and hormones. Extraction of carbohydrates, lipids and proteins. Study of DNA and its structure.

M.Sc. Ag. Horticulture (Fruit Science)

SEMESTER-I

PBG-410

Principles of Plant Breeding (Minor)

Time: 3 Hours

Max. Marks: 150

Theory: 75

Practical: 37

Internal assessment: 38

Periods per week: 04+06

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. In all nine questions should be asked, of which first question of 15 marks (Comprising of 10 short answer type questions covering the whole syllabus) will be compulsory.
4. Out of remaining eight questions, two questions should be asked from each section, out of which the candidates are required to attempt one question from each section. All question will carry equal marks (15).

Theory:

Section-A: History of Plant Breeding, objectives and achievements. Centres of origin, biodiversity and its significance. Plant introduction and role of plant genetic resources in plant breeding.

Section-B: Genetic basis of breeding self- and cross-pollinated crops, Mating systems and response to selection. Pure line theory. Breeding methods in self-, cross-pollinated and asexually reproducing crops. Heterosis and inbreeding.

Section-C: Concept of plant ideotype. Transgressive breeding. Hybrid breeding. Self-incompatibility and male sterility in crop plants and their commercial exploitation. Mutation breeding.

Section-D: Breeding for abiotic and biotic stresses. Testing, release and notification of varieties. Maintenance breeding. Participatory Plant Breeding. Plant Breeders' Rights and regulations for plant variety protection and farmers' rights.

Practical:

Floral biology of self- and cross-pollinated species. Selfing and crossing techniques. Selection methods in segregating populations and evaluation of breeding material. Maintenance of experimental records. Estimation of heterosis and inbreeding depression. Techniques in hybrid seed production using male-sterility in field crops.

M.Sc. Ag. Horticulture (Fruit Science)

STA-415: Statistical Methods for Research Workers

Time: 3 Hours

Max. Marks: 150

Theory: 75

Practical: 37

Internal assessment: 38

Periods per week : 04+3

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. In all nine questions should be asked, of which first question of 15 marks (Comprising of 10 short answer type questions covering the whole syllabus) will be compulsory.
4. Out of remaining eight questions, two questions should be asked from each section, out of which the candidates are required to attempt one question from each section. All question will carry equal marks (15).

Theory

Section-A: Probability and fitting of standard frequency distribution, sampling techniques, sampling distributions, mean and standard error.

Section-B: Simple partial, multiple and intra- class correlation and multiple regression.

Section-C: Tests of significance, students'-t, chi-square and large sample tests, confidence intervals.

Section-D: Analysis of variance for one way and two way classification with equal cell frequencies, transformation of data.

Practical:

Fitting of distributions, samples and sampling distributions, correlation and regression, tests of significance and analysis of variance.

Note: Students shall be trained to use computer to analysis the data, using available softwares. However, during university examination students will use scientific calculators to analyse the data.

M.Sc. Ag. Horticulture (Fruit Science)

SEMESTER-II

FSC-521: Sub-Tropical and Temperate Fruit Production

Time: 3 Hours

Max. Marks: 150

Theory: 75

Practical: 37

Internal assessment: 38

Periods per week: 04+3

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. In all nine questions should be asked, of which first question of 15 marks (Comprising of 10 short answer type questions covering the whole syllabus) will be compulsory.
4. Out of remaining eight questions, two questions should be asked from each section, out of which the candidates are required to attempt one question from each section. All question will carry equal marks (15).

Theory

Origin, distribution, commercial importance and export potential. Ecophysiological requirements. Species and varieties. Rootstocks and propagation. Planting, root zone, training and pruning. Nutrition and water requirements, fertigation, role of bio-regulators, 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. Industrial and export potential, Agri. Export Zones (AEZ) and industrial support. Fruit crops-

Section-A: Apple, pear, plum, peach, quince, kiwifruit, strawberry.

Section-B: Apricot, cherries, hazelnut, walnut, almond, pistachio.

Section-C: Grapes, litchi, loquat, persimmon, mangosteen, carambola, pecan.

Section-D: Bael, wood apple, fig, jamun, rambutan and pomegranate.

Practical:

Description and identification of species and varieties. Growth and development. Growth regulation. Nutritional and physiological disorders and their control. Rejuvenation of old and unproductive trees. Visit to commercial orchards. Project preparation for establishing commercial orchards.

M.Sc. Ag. Horticulture (Fruit Science)

SEMESTER-II

FSC-522:

Breeding of Fruit Crops

Time: 3 Hours

Max. Marks: 150

Theory: 75

Practical: 37

Internal assessment: 38

Periods per week: 04+6

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. In all nine questions should be asked, of which first question of 15 marks (Comprising of 10 short answer type questions covering the whole syllabus) will be compulsory.
4. Out of remaining eight questions, two questions should be asked from each section, out of which the candidates are required to attempt one question from each section. All question will carry equal marks (15).

Theory

Origin and distribution, taxonomical status of species and cultivars. Cytogenetics and genetic resources. Blossom biology, breeding objectives, systems and ideotypes. Crop improvement through introduction, selection, hybridization, mutation breeding, polyploid breeding and rootstock breeding. Improvement of quality traits. Resistance breeding for biotic and abiotic stresses. Biotechnological interventions, achievements and future thrusts in the following selected crops.

Crops:

Section-A: Mango, banana, citrus, litchi.

Section-B: Apple, pear, peach, plum, almond and strawberry.

Section-C: Grapes, guava, papaya.

Section-D: Amla, ber, jamun, phalsa,

Practical:

Characterization of germplasm. Blossom biology and anthesis. Estimating fertility status. Practices in hybridization, ploidy breeding, mutation breeding, evaluation of biometrical and quality traits. Screening for resistance, developing breeding programme for specific traits. Visit to research stations.

M.Sc. Ag. Horticulture (Fruit Science)

SEMESTER-II

FSC-523:

Post Harvest Technology of Fruit Crops

Time: 3 Hours

Max. Marks: 150

Theory: 75

Practical: 37

Internal assessment: 38

Periods per week: 04+3

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. In all nine questions should be asked, of which first question of 15 marks (Comprising of 10 short answer type questions covering the whole syllabus) will be compulsory.
4. Out of remaining eight questions, two questions should be asked from each section, out of which the candidates are required to attempt one question from each section. All questions will carry equal marks (15).

Theory

Section-A: Importance and scope. Maturity indices, harvesting practices and grading for specific market requirements.

Section-B: Influence of pre-harvest practices, enzymatic and textural changes, respiration and transpiration. Physiology and biochemistry of fruit ripening, ethylene evolution and its management.

Section-C: Pre-cooling. Factors leading to post-harvest losses. Treatments prior to transportation viz. chlorination, waxing, chemicals, bio-control agents, natural plant products fungicides, hot-water, vapour heat treatment, sulphur fumigation and irradiation.

Section-D: Methods of storage. Physical injuries and disorders during storage. Packing methods and transport. Quality evaluation.

Practical:

Analyzing maturity stages of commercially important fruit crops, harvesting methods, pre-cooling methods, grading. Pre-harvest and post-harvest application of growth substances, fungicides, nutrients, waxes and hot water treatments, sulphuring. Improved packing and storage of important horticultural commodities. Physiological loss in weight of fruits. Estimation of transpiration, respiration rate, ethylene release. Estimation of quality characteristics in stored fruits. Cold chain management – visit to cold storage and CA storage units.

M.Sc. Ag. Horticulture (Fruit Science)

FSC-524

Nursery Management of Horticultural Crops

Time: 3 Hours

Max. Marks: 150

Theory: 75

Practical: 37

Internal assessment =38

Periods per Week 4+3

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. In all nine questions should be asked, of which first question of 15 marks (Comprising of 10 short answer type questions covering the whole syllabus) will be compulsory.
4. Out of remaining eight questions, two questions should be asked from each section, out of which the candidates are required to attempt one question from each section. All question will carry equal marks (15).

Theory:

Section A: Principles of plant propagation. Seed dormancy and germination. Selection of rootstock and scion. Stock scion relationship. Factors affecting successful propagation. Physiology of dwarfing rootstock.

Section-B: Different methods of propagation like division, cutting, layering, budding and grafting, and tissue culture. Containers, media and mixtures.

Section C: Propagation structures. Nursery act, quarantine and certification. Suitable soil and sub-soil. Progeny trees, block establishment and maintenance.

Section D: Nutrient management and plant protection measures in nursery. Economics of raising fruit plant nursery.

Practical: Raising of rootstock. Methods to break seed dormancy. Propagation techniques. Training, lifting and packing of nursery plants. Preparation of media and mixtures, and raising nursery in poly bags. Project formulation and valuation of nursery raising.

M.Sc. Ag. Horticulture (Fruit Science)

FSH-524

Growth and Development of Horticultural Crops

Time: 3 Hours

Max. Marks: 150

Theory: 75

Practical: 37

Internal assessment =38

Periods per Week 4+3

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. In all nine questions should be asked, of which first question of 15 marks (Comprising of 10 short answer type questions covering the whole syllabus) will be compulsory.
4. Out of remaining eight questions, two questions should be asked from each section, out of which the candidates are required to attempt one question from each section. All question will carry equal marks (15).

Theory:

Section-A: Cellular structures and their functions; definition of growth and development, growth analysis and its importance in Horticulture production.

Section-B: Physiology of dormancy and germination of Horticulture seeds, tubers and bulbs; Role of auxins, gibberellins, cytokinins and abscisic acid; Application of plant growth regulators for various purposes in Horticulture crops; Role and mode of action of morphactins, anti transpirants, anti-auxin, ripening retardant and plant stimulants in Horticulture crop production.

Section-C: Role of light, temperature and photoperiod on growth, development of underground parts, flowering and sex expression in Horticulture crops; apical dominance.

Section-D: Physiology of fruit set, fruit development, fruit growth, flower and fruit drop; parthenocarpy in Horticulture crops; phototropism, ethylene inhibitors, senescence and abscission; fruit ripening and physiological changes associated with ripening in Horticulture crops.

Practical:

Preparation of solutions of plant growth substances and their application; experiments in breaking and induction of dormancy by chemicals; induction of parthenocarpy and fruit ripening; application of plant growth substances for improving flower initiation, changing sex expression, Checking flower and fruit drops and improving fruit set, growth analysis techniques in Horticultural crops

M.Sc. Ag. Horticulture (Fruit Science)

SEMESTER-II

BCH-420

Experiments in Biochemistry (Minor)

Time: 3 Hours

Max. Marks: 150

Theory: 75

Practical: 37

Internal assessment: 38

Periods per week: 04+6

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. In all nine questions should be asked, of which first question of 15 marks (Comprising of 10 short answer type questions covering the whole syllabus) will be compulsory.
4. Out of remaining eight questions, two questions should be asked from each section, out of which the candidates are required to attempt one question from each section. All question will carry equal marks (15).

Theory:

Section-A Concepts of pH and buffers. Determination of total sugars, reducing and non-reducing sugars, starch, free fatty acids, cholesterol and phospholipids.

Section-B Determination of free amino acids and proteins. Separation of sugars by paper chromatography. Extraction of lipids, separation of polar and non-polar lipids by TLC.

Section-C Fatty acid composition by GLC. Estimation of Vitamin C and tocopherols. Isolation and purification of acid phosphatase.

Section-D Estimation of chlorophyll, carotenoids and phytic acid. Extraction and estimation of nucleic acids.

Practical: Preparation of buffer solutions. Estimation of sugars, starch and lipids. Extraction of lipids. Separation of sugars by paper chromatography. Estimation of Vitamin C, chlorophyll and carotenoids. Extraction and estimation of nucleic acids.

M.Sc. Ag. Horticulture (Fruit Science)

SEMESTER-II

PBG-420

Breeding for Biotic and Abiotic Stress Resistance (Minor)

Time: 3 Hours

Max. Marks: 150

Theory: 75

Practical: 37

Internal assessment: 38

Periods per week: 04+6

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. In all nine questions should be asked, of which first question of 15 marks (Comprising of 10 short answer type questions covering the whole syllabus) will be compulsory.
4. Out of remaining eight questions, two questions should be asked from each section, out of which the candidates are required to attempt one question from each section. All question will carry equal marks (15).

Theory:

Section-A: Plant breeding with reference to biotic and abiotic stress resistance. Biotic stresses in economically important crops. Host defense responses to pathogen invasions. Biochemical and molecular mechanisms. Host-pathogen interactions.

Section-B: Gene-for-gene hypothesis. Acquired and induced immunity. Systemic acquired resistance (SAR). Concept of signal transduction and other host-defense mechanisms against viruses and bacteria. Types and genetic mechanisms of resistance to biotic stresses. Phenotypic screening methods for major pests and diseases.

Section-C: Gene pyramiding. Classification of abiotic stresses - moisture stress/drought, water logging and submergence, wind, acidity, salinity/alkalinity/sodicity, temperature etc. Stress due to soil factors and mineral toxicity. Physiological and phenological responses. Genetics of abiotic stress resistance.

Section-D: Genes and genomics in breeding for abiotic stresses. Utilizing MAS procedures. Breeding for resistance to abiotic stresses. Exploitation of wild relatives as a source of resistance to biotic and abiotic factors in major field crops. Transgenics in management of biotic and abiotic stresses.

Practical:

Phenotypic screening techniques for sucking pests, chewing pests, nematodes and borers. Use of standard MAS procedures. Phenotypic screening methods for diseases caused by fungi and bacteria. Screening crops for drought, flood resistance, acidity, alkalinity and temperature etc.

M.Sc. Ag. Horticulture (Fruit Science)

SEMESTER-II

STA-425: Experimental Designs for Research Workers

Time: 3 Hours

Max. Marks: 150

Theory: 75

Practical: 37

Internal assessment: 38

Periods per week: 04+3

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. In all nine questions should be asked, of which first question of 15 marks (Comprising of 10 short answer type questions covering the whole syllabus) will be compulsory.
4. Out of remaining eight questions, two questions should be asked from each section, out of which the candidates are required to attempt one question from each section. All question will carry equal marks (15).

Theory:

Section-A: Need for designing of experiments- characteristics of a good design, basic principles- randomization, replication and local control, uniformity trials- size and shape of plots and blocks, analysis of variance and interpretation of data.

Section-B: Completely randomized, randomized block and latin square design, multiple comparison tests, factorial experiments- interpretation of main effects and interactions,

Section-C: Orthogonality and partitioning of degrees of freedom confounding in 2^3 , 2^4 and 3^3 designs, split and strip plot designs, crossover designs and balanced incomplete block designs, response surface designs, switch over trials and long term experiments;

Section-D: Selection of experimental design, mechanical errors in field experiments and methods of reducing it, presentation of research results.

Practical:

Time: 3 Hours

Uniformity trials, completely randomized, randomized block and latin square designs, missing plot and analysis, of covariance, 2^3 , 2^4 and 3^3 simple and confounded experiments, split and strip plot designs, cross over Uniformity trials, completely randomized, randomized block and latin square designs, missing plot and analysis, of covariance, 2^3 , 2^4 and 3^3 simple and confounded experiments, split and strip plot designs, cross over and balanced incomplete block designs.

Note: Students shall be trained to use computer to analysis the data, using available softwares. However, during university examination students are allowed to use scientific calculators to analysis is the data.

Note: Students are allowed to use scientific calculator in University examinations; statistical tables will be provided to students in examinations. No rigorous mathematical proofs are expected from students; stress will be on application only.

M.Sc. Ag. Horticulture (Fruit Science)

SEMESTER-III

FSC-531: Principles and Practices of Plant Propagation.

Time: 3 Hours

Max. Marks: 150

Theory: 75

Practical: 37

Internal assessment =38

Periods per week: 04+3

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. In all nine questions should be asked, of which first question of 15 marks (Comprising of 10 short answer type questions covering the whole syllabus) will be compulsory.
4. Out of remaining eight questions, two questions should be asked from each section, out of which the candidates are required to attempt one question from each section. Each question will carry equal marks (15).

Theory

Section-A: Introduction, life cycles in plants, cellular basis for propagation. Sexual propagation, apomixis, polyembryony, chimeras.

Section-B: Factors influencing seed germination, hormonal regulation of germination and seedling growth. Seed quality, treatment, packing, storage, certification and testing. Rooting of cuttings under mist and hot beds. Physiological, anatomical and biochemical aspects of root induction in cuttings.

Section-C: Selection of elite mother plants. Establishment of bud wood bank. Stock, scion and inter stock relationship and Incompatibility. Physiology of dwarfing rootstocks. Rejuvenation. Progeny orchard and scion bank.

Section-D: Micro-propagation - in vitro clonal propagation, direct organogenesis, embryogenesis, micrografting and Meristem culture. Hardening, packing and transport of micro-propagules. Nursery structures.

Practical:

Anatomical studies in rooting of cutting and graft union. Propagation structures. Use of media and PGR. Micropropagation and hardening of plants. Explant preparation, media preparation, culturing in vitro, clonal propagation, meristem culture, shoot tip culture, axillary bud culture., Micro grafting and hardening. Visit to TC labs and nurseries.

M.Sc. Ag. Horticulture (Fruit Science)

SEMESTER-III

FSC-532: Plant Growth Regulators in Fruit Crops

Time: 3 Hours

Max. Marks: 150

Theory: 75

Practical: 37

Internal assessment =38

Periods per week: 04+6

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. In all nine questions should be asked, of which first question of 15 marks (Comprising of 10 short answer type questions covering the whole syllabus) will be compulsory.
4. Out of remaining eight questions, two questions should be asked from each section, out of which the candidates are required to attempt one question from each section. Each question will carry equal marks (15).

Theory

Section-A: History, nomenclature, role and physiological effects of plant growth regulators in fruit crops;

Section-B: Methods of application of growth regulators; Methods of isolation and estimation; Mechanism of action;

Section-C: Role of plant regulators in plant propagation, seed dormancy, apical dominance, rooting of cutting, flower initiation, fruit set and fruit development;

Section-D: Role of plant regulators in flower and fruit thinning, parthenocarpy, fruit drop and induced fruit abscission, fruit ripening and quality improvement in fruit crops.

Practical:

Preparation of growth regulator solutions; Methods of application; Application in plant propagation, prevention of flower and fruit drop; induction of parthenocarpy, fruit set, fruit thinning, fruit ripening and quality improvement; Isolation and bioassays for the estimation of plant regulators.

M.Sc. Ag. Horticulture (Fruit Science)

SEMESTER-III

BCH-430

Fundamentals of Nutritional Biochemistry(Minor)

Time: 3 Hours

Max. Marks: 150

Theory: 75

Practical: 37

Internal assessment =38

Periods per week : 04+3

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. In all nine questions should be asked, of which first question of 15 marks (Comprising of 10 short answer type questions covering the whole syllabus) will be compulsory.
4. Out of remaining eight questions, two questions should be asked from each section, out of which the candidates are required to attempt one question from each section. All question will carry equal marks (15).

Theory:

Section-A Role of major biomolecules in nutrition. Structure and physiological role of vitamins. Basal metabolism and caloric requirements.

Section-B Balanced diet. Metabolic disorders of carbohydrates and lipids. Evaluation of protein quality by chemical and biological methods.

Section-C Protein malnutrition. Detoxification and excretion of anti-metabolic agents and other drugs. Biochemical functions of minerals.

Section-D Anti-nutrients, antioxidants in human health. Pre and Probiotics.

Practical: Study of biomolecules and their role in nutrition. Role of vitamins. Evaluation of protein quality by chemical and biological methods. Biochemical functions of minerals. . Pre and Probiotics

M.Sc. Ag. Horticulture (Fruit Science)

SEMESTER-III

PBG-430

Maintenance Breeding and Seed Production (Minor)

Time: 3 Hours

Max. Marks: 150

Theory: 75

Practical: 37

Internal assessment =38

Periods per week: 04+3

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. In all nine questions should be asked, of which first question of 15 marks (Comprising of 10 short answer type questions covering the whole syllabus) will be compulsory.
4. Out of remaining eight questions, two questions should be asked from each section, out of which the candidates are required to attempt one question from each section. Each questions will carry equal marks (15).

Theory:

Section-A: Variety development and maintenance. Defining variety, cultivar, extant variety, derived variety, reference variety, farmers' variety, hybrid and population.

Section-B: Variety testing, release and notification systems in India and abroad. US testing. Genetic deterioration of varieties.

Section-C: Maintenance of varieties. Principles of seed production. Generation system of seed multiplication. Quality seed production of cereals and millets, pulses, oilseeds, cotton and forages.

Section-D: Seed certification. Seed laws and plant variety protection regulations in India and international systems.

Practical:

Identification of suitable areas for seed production. Ear-to-row method and nucleus seed production. Main characteristics of released and notified varieties, hybrids and parental lines. Identification of important weeds/objectable weeds. Determination of isolation distance and planting ratios in different crops. Seed production techniques of varieties in different crops. Hybrid seed production technology of important crops.

M.Sc. Ag. Horticulture (Fruit Science)

SEMESTER-III

BOT-430

Physiology of Growth and Development

Time: 3 Hours

Max. Marks: 150

Theory: 75

Practical: 37

Internal assessment =38

Periods per week: 04+3

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. In all nine questions should be asked, of which first question of 15 marks (Comprising of 10 short answer type questions covering the whole syllabus) will be compulsory.
4. Out of remaining eight questions, two questions should be asked from each section, out of which the candidates are required to attempt one question from each section. All question will carry equal marks (15).

Theory:

Concepts of growth, differentiation and pattern formation; growth curves, meristems, growth kinetics, factors affecting growth and general aspects of development, level of differentiation, control of development at genetic level. Hormones and growth regulators - auxins, gibberellins, cytokinins, ethylene, ABA, other inhibitors, retardants, polyamines, aliphatic alcohols, brassins, hormonal regulation of growth and development, plant movements; photoperiodism, phytochrome, flowering hormones, vernalization, abscission, ageing, senescence; physiology of seed and fruit development; seed germination; seed and bud dormancy. Plant physiology and agriculture.

Practical:

Experiments on growth measurements, hormonal bioassays, plant movements; experiments on quality of light on seed germination, breaking of dormancy. Experiments on photoperiodism. Experiments on hormonal regulation of development.

M.Sc. Ag. Horticulture (Fruit Science)

SEMESTER-III

CREDIT SEMINAR

Total Marks: 100
Periods per week: 03

M.Sc. Ag. Horticulture (Fruit Science)

SEMESTER-IV

FSC-541:

Citriculture

Time: 3 Hours

Max. Marks: 100

Theory: 50

Practical: 25

Internal assessment =25

Periods per week: 4+3

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. In all nine questions should be asked, of which first question of 10 marks (Comprising of 10 short answer type questions covering the whole syllabus) will be compulsory.
4. Out of remaining eight questions, two questions should be asked from each section, out of which the candidates are required to attempt one question from each section. Each questions will carry equal marks (10).

Theory:

Section-A: Origin, distribution and commercial importance: Important cultivated species and varieties:

Section-B: Propagation and rootstocks climatic and soil requirements:

Section-C: Training and pruning: Intercropping and weed control. Fertilization and irrigation:

Section-D: Physiological and pathological disorder and their control: Harvesting and handling of fruits.

Practical:

Description and identification of different citrus species and cultivars: Training and pruning: study of various stionic combinations: identification of rootstocks through chemical test: weed control: control of fruit drop: nutritional disorders: Quality analysis: fertilization and irrigation.

M.Sc. Ag. Horticulture (Fruit Science)

SEMESTER-IV

FSC-542: Orchard Floor Management and Organic Agriculture

Time: 3 Hours

Max. Marks: 100

Theory: 50

Practical: 25

Internal assessment =25

Periods per week: 04+3

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. In all nine questions should be asked, of which first question of 10 marks (Comprising of 10 short answer type questions covering the whole syllabus) will be compulsory.
4. Out of remaining eight questions, two questions should be asked from each section, out of which the candidates are required to attempt one question from each section. Each questions will carry equal marks (10).

Theory:

Section-A: Soil quality and its management for orchard plantation. Effect of soil organic matter on physic-chemical characteristics of the soil.

Section-B: Moisture conservation and water requirement for fruit crops. Principles, methods and scheduling of irrigation. Principles and status of organic horticulture. Organic farming systems.

Section-C: Organic inputs and their role. EM technology and its impact. Indigenous practices of sustainable soil fertility, weed management and biological/natural control of pests and diseases. Fruit quality improvement.

Section-D: Good Agricultural Practices (GAP), HACCP and certification of organic products. Standards evolved by different agencies. Constraints in certification, organic horticulture and export.

Practical:

Different methods of irrigation. Mulching and weed control in orchards. Determination of soil organic matter. Inter-cropping exercise. Input analysis of manures. Bio-composting, biofertilizers and their application. Methods of preparation of organic manures. EM technology and products. Biological/natural control of pests and diseases. Soil solarization. Case studies. Residue analysis in organic products and documentation.

M.Sc. Ag. Horticulture (Fruit Science)

SEMESTER-IV

RESEARCH WORK

S/US

Periods per week: 04