

SCHEME & SYLLABUS
M.Sc-Ag. Horticulture (Fruit Science)



Department of Agriculture
UISH
Sant Baba Bhag Singh University
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**Compulsory for Master's programme



CREDIT LOAD FOR MASTERS PROGRAM

I	MAJOR CREDITS	23
II	MINOR CREDITS	06
III	SUPPORTING	08
IV	MASTER'S COMPREHENSIVE	02
V	MASTER'S SEMINAR	01
VI	MASTER'S RESEARCH	20
TOTAL I to VI		40
	TOTAL	40+20 = 60



M.Sc Ag. Horticulture (Fruit Science) scheme

SEMESTER-I						
S No.	Sub Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	AGR531-18	Tropical and Dry Land Fruit Production	2:0:2	2:0:1	4	3
2	AGR533-18	Sub-tropical and Temperate Fruit Production	2:0:2	2:0:1	4	3
3	AGR535-18	Biodiversity and Conservation of fruit Crops	2:0:2	2:0:1	4	3
4	AGR537-18	Post Harvest technology of fruit crops	2:0:2	2:0:1	4	3
5	MAT529-18	Experimental designs	2:0:2	2:0:1	4	3
6	LIB501-18	Library and information services	0:0:1	0:0:1	1	1
7	CSE551-18	Computer Fundamentals and Programming	2:0:2	2:0:1	4	3
		Total			25	19

Total Contact hrs: 25
Total Credit Hours: 19

SEMESTER-II

S No.	Sub Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
Subjects						
1	AGR530-18	Breeding of Fruit Crops	2:0:2	2:0:1	4	3
2	AGR532-18	Biotechnology in fruit crops	1:0:2	1:0:1	3	2
3	AGR534-18	Organic Horticulture	2:0:2	2:0:1	4	3
4	AGR-550-18	Soil erosion and conservation	2:0:2	2:0:1	4	3
5	AGR-552-18	Soil, Water and Air pollution	2:0:2	2:0:1	4	3
6	AGR-500	Master's Research	0:0:5	0:0:5	5	5
				Total	24	19

Total Contact hrs: 24

Total Credit Hours:19



SEMESTER-III						
S No.	Sub Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	AGR631-18	Protected Cultivation	2:0:2	2:0:1	4	3
2	EVS 501-18	Disaster Management	1:0:0	1:0:0	1	1
3	AGR601-18	Master's Research	0:0:5	0:0:5	5	5
4	AGR603-18	Master's Seminar	1:0:0	1:0:0	1	1
5	AGR 605-18	M.Sc Comprehensive exam	0:0:4	0:0:2	4	2
				Total	15	12

Total Contact hrs: 15

Total Credit Hours: 12

SEMESTER-IV						
S No.	Sub Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	AGR600-18	Master's Research	0:0:10	0:0:10	10	10
				Total	10	10

Total Contact hrs: 10

Total Credit Hours: 10

Course Scheme Summary

Semester	L	T	P	Contact hrs/wk	Credits	Training
1	13	0	12	25	19	
2	9	0	15	24	19	
3	4	0	11	15	12	
4	0	0	10	10	10	
Total	26	0	46	72	60	

SEMESTER-I

Course Code	AGR531-18
Course Title	Tropical and Dry Land Fruit Production
Type of course	Theory & Practical
L T P	2 0 1
Credits	3 (2 +1)
Course prerequisite	B.Sc (Agriculture)
Course objectives (CO)	To impart basic knowledge about the importance and management of tropical and dry land fruits grown in India.

Syllabus

Theory

Commercial varieties of regional, national and international importance, ecophysiological requirements, recent trends in propagation, rootstock influence, planting systems, cropping systems, root zone and canopy management, nutrient management, water management, fertigation, role of bioregulators, abiotic factors limiting fruit production, physiology of flowering, pollination fruit set and development, honeybees in cross pollination, physiological disorders- causes and remedies, quality improvement by management practices; maturity indices, harvesting, grading, packing, storage and ripening techniques; industrial and export potential, Agri. Export Zones(AEZ) and industrial supports.

Crops

UNIT I- Mango ,Banana, Citrus and Papaya

UNIT-II Guava, Sapota , Jackfruit and Pineapple

UNIT-III Annonas, Avocado, Pomegranate, Phalsa

UNIT-IV Ber, minor fruits of tropics

Practical

1. Identification of important cultivars,
2. Observations on growth and development, practices in growth regulation,
3. Malady diagnosis,
4. Analyses of quality attributes
5. Visit to tropical and arid zone orchards,
6. Project preparation for establishing commercial orchards.

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	Fruit Growing	J.S. Bal	Kalyani
2	Hand Book of Horticulture	-	ICAR
3	Package and Practices of Fruits	-	PAU



Course Code	AGR533-18
Course Title	Sub-tropical and Temperate Fruit Production
Type of course	Theory & Practical
L T P	2 0 1
Credits	2 +1
Course prerequisite	B.Sc (Agriculture)
Course objectives (CO)	To impart basic knowledge about the importance and management of subtropical and temperate fruits grown in India

Syllabus

Theory

Commercial varieties of regional, national and international importance, ecophysiological requirements, recent trends in propagation, rootstock influence, planting systems, cropping systems, root zone and canopy management, nutrient management, water management, fertigation, bioregulation, abiotic factors limiting fruit production, physiology of flowering, fruit set and development, abiotic factors limiting production, physiological disorders-causes and remedies, quality improvement by management practices; maturity indices, harvesting, grading, packing, precooling, storage, transportation and ripening techniques; industrial and export potential, Agri Export Zones(AEZ) and industrial support.

Crops

UNIT I: Apple, pear, Plums, peach quince, grapes, Litchi, loquat

UNIT II: Apricot, cherries, hazlenut persimmon, kiwifruit, strawberry

UNIT III: Nuts- walnut, almond, pistachio, pecan

UNIT IV: Minor fruits- mangosteen, carambola, bael, wood apple, fig, jamun, rambutan, pomegranate

Practical

1. Identification of important cultivars
2. Observations on growth and development, practices in growth regulation
3. Malady diagnosis
4. Analyses of quality attributes
5. Visit to tropical, subtropical, humid tropical and temperate orchards
6. Project preparation for establishing commercial orchards

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	Fruit Growing	J.S. Bal	Kalyani
2	Hand Book of Horticulture	-	ICAR
3	Package and Practices of Fruits	-	PAU

Course Code	AGR535-18
Course Title	Biodiversity and conservation of fruit crops
Type of course	Theory & Practical
L T P	2 0 1
Credits	2 +1
Course prerequisite	B.Sc (Agriculture)
Course Objectives (CO)	Understanding the principles of biodiversity and strategies in germplasm conservation of fruit crops.

Syllabus

Theory:

UNIT-I

Biodiversity and conservation; issues and goals, centers of origin of cultivated fruits; primary and secondary centers of genetic diversity..

UNIT-II

Present status of gene centers; exploration and collection of germplasm; conservation of genetic resources – conservation in situ and ex situ. GIS and documentation of local biodiversity, Geographical indication

UNIT- III

Germplasm conservation- problem of recalcitrancy - cold storage of scions, tissue culture, cryopreservation, pollen and seed storage; inventory of germplasm, introduction of germplasm, plant quarantine. Intellectual property rights, regulatory horticulture. Detection of genetic constitution of germplasm and maintenance of core group.

UNIT-IV

Crops

Mango, sapota, citrus, guava, banana, papaya, grapes, jackfruit, custard, apple, ber, aonla, malus, Prunus sp, 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.

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	Biodiversity in Horticultural Crops Vol. I	Peter KV & Abraham Z	Daya Publ. House.
2	Biodiversity in Horticultural Crops Vol.II	Peter KV & Abraham Z	Daya Publ. House.



Course Code	AGR537-18
Course Title	Post harvest technology for fruit crops
Type Course	Theory & Practical
L T P	2 0 1
Credits	3 (2 +1)
Course Pre-requisite	B.Sc (Agriculture)
Course Objective (CO)	To facilitate deeper understanding on principles and practices of post-harvest management of fruit crops.

Syllabus

UNIT-I

Maturity indices, harvesting practices for specific market requirements, influence of pre-harvest practices, enzymatic and textural changes, respiration, transpiration. Physiology and biochemistry of fruit ripening, ethylene evolution and ethylene management, factors leading to post-harvest loss, pre-cooling.

UNIT-II

Treatments prior to shipment, viz., chlorination, waxing, chemicals, biocontrol agents and natural plant products. Methods of storage- ventilated, refrigerated, MAS, CA storage, physical injuries and disorders

UNIT-III

Packing methods and transport, principles and methods of preservation, food processing, canning, fruit juices, beverages, pickles, jam, jellies, candies.

UNIT-IV

Dried and dehydrated products, nutritionally enriched products, fermented fruit beverages, packaging technology, processing waste management, food safety standards.

Practical

1. Analyzing maturity stages of commercially important horticultural crops,
2. Improved packing and storage of important horticultural commodities,
3. Physiological loss in weight of fruits and vegetables, estimation of transpiration, respiration rate, ethylene release and study of vase life extension in cut flower using chemicals,
4. Estimation of quality characteristics in stored fruits and vegetables,
5. Cold chain management - visit to cold storage and CA storage units,
6. Visit to fruit and vegetable processing units, project preparation,
7. Evaluation of processed horticultural products.

Recommended books:-

S.No.	Name	Author(S)	Publisher
1	Post Harvest Physiology and Storage of Tropical and Sub-tropical Fruits	Mitra SK.	CABI

Course Code	AGR539-18
Course Title	Canopy management in fruit crops
Type Course	Theory & Practical
L T P	1 0 1
Credits	2(1 +1)
Course Pre-requisite	B.Sc (Agriculture)
Course Objective (CO)	To impart knowledge about the principles and practices in canopy management of fruit crops

Syllabus

Theory

UNIT I

Canopy management - importance and advantages; factors affecting canopy development.

UNIT II

Canopy types and structures with special emphasis on geometry of planting, canopy manipulation for optimum utilization of light. Light interception and distribution in different types of tree canopies.

UNIT III

Spacing and utilization of land area - Canopy classification; Canopy management through rootstock and scion.

UNIT IV

Canopy management through plant growth inhibitors, training and pruning and management practices. Canopy development and management in relation to growth, flowering, fruiting and fruit quality in temperate fruits, grapes, passion fruits, mango, sapota, guava, citrus and ber.

Practical

1. Study of different types of canopies, training of plants for different canopy types
2. Study of canopy development through pruning
- 3 . Use of plant growth inhibitors
4. Geometry of planting
5. Study on effect of different canopy types on production and quality of fruits

Recommended books:-

S.No.	Name	Author(S)	Publisher
1	Management of Horticultural Crops	Pradeepkumar T, Suma	New India Publ. Agency
2	The Grape, Improvement, Production and Post Harvest Management	Chadha KL & Shikhamany SD	Malhotra Publ. House.



Course Code	AGR541-18
Course Title	Propagation and Nuresery management for fruit crops
Type Course	Theory & Practical
L T P	2 0 1
Credits	3(2 +1)
Course Pre-requisite	B.Sc (Agriculture)
Course Objective (CO)	Familiarization with principles and practices of propagation and nursery management for fruit crops

Syllabus

Theory

UNIT I

Introduction, life cycles in plants, cellular basis for propagation, sexual propagation, apomixis, polyembryony, chimeras. Principles factors influencing seed germination of horticultural crops, dormancy, hormonal regulation of germination and seedling growth.

UNIT II

Seed quality, treatment, packing, storage, certification, testing. Asexual propagation –rooting of soft and hard wood cutting under mist by growth regulators. Rooting of cuttings in hotbeds. Physiological, anatomical and biochemical aspects of root induction in cuttings. Layering –principle and methods.

UNIT III

Budding and grafting – selection of elite mother plants, methods. Establishment of bud wood bank, stock, scion and inter stock, relationship – Incompatibility. Rejuvenation through top working – Progeny orchard and scion bank.

UNIT IV

Micro-propagation – principles and concepts, commercial exploitation in horticultural crops. Techniques - *in vitro* clonal propagation, direct organogenesis, embryogenesis, micrografting, meristem culture. Hardening, packing and transport of micro-propagules. Nursery – types, structures, components, planning and layout. Nursery management practices for healthy propagule production.

Practical

1. Anatomical studies in rooting of cutting and graft union
2. To study the construction of propagation structures
3. study of media and PGR.
4. Hardening –case studies, micropropagation
5. To study the explant preparation, media preparation
6. To study the culturing – *in vitro* clonal propagation, meristem culture

7. To study the shoot tip culture, axillary bud

Recommended books:-

S.No.	Name	Author(S)	Publisher
1	Plant Growth and Development: a Molecular Approach.	Fosket DE.	Wiley
2	Propagation of Horticultural Crops	Rajan S & Baby LM	New India Publ. Agency



Course Code	AGR542-18
Course Title	GROWTH AND DEVELOPMENT OF HORTICULTURAL CROPS
Type Course	Theory & Practical
L T P	2 0 1
Credits	3(2 +1)
Course Pre-requisite	B.Sc (Agriculture)
Course Objective (CO)	To develop understanding of growth and development of horticultural crops which have implications in their management.

Syllabus

Theory

UNIT I

Growth and development- definition, parameters of growth and development, growth dynamics, morphogenesis. 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.

UNIT II

Assimilate partitioning during growth and development, influence of water and mineral nutrition during growth and development, biosynthesis of auxins, gibberellins, cytokinins, abscissic acid, ethylene, brassinosteroids, growth inhibitors, morphactins, role of plant growth promoters and inhibitors

UNIT III

Developmental physiology and biochemistry during dormancy, bud break, juvenility, vegetative to reproductive interphase, flowering, pollination, fertilization and fruit set, fruit drop, fruit growth, ripening and seed development.

UNIT IV

Growth and developmental process during stress - manipulation of growth and development, 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
2. Stratification of seeds, tubers and bulbs
3. Visit to arid, subtropical and temperate horticultural zones to identify growth and development patterns, techniques of growth analysis, evaluation of photosynthetic efficiency under different environments, Study of growth regulator functions, hormone assays, understanding ripening phenomenon in fruits vegetables
4. Study of impact of physical manipulations on growth and development
5. Study of chemical manipulations on growth and development, understanding stress impact on growth and development

Recommended books:-

S.No.	Name	Author(S)	Publisher
1	Plant Growth and Development: a Molecular Approach.	Fosket DE.	Wiley
2	Mineral Nutrition of Plants: Principles and Perspectives	Epstein E. 1972	Academic Press.

Course Code	MAT529-18
Course Title	Experimental designs
Type of Course	Theory
L T P	2 0 0
Credits	2(2 +0)
Course Prerequisite	B.Sc (Agriculture)
Course Objectives (CO)	Mathematics is really a great tool to understand the things correctly. The aim of the course is to enable students : (1) To understand the theory knowledge as well as practical knowledge of different formulas.(2) To inculcate the skills to use different methods to solve the applied problems.

Syllabus

UNIT-I

Need for designing of experiments, characteristics of a good design, basic principles of designs - randomization, replication and local control. Uniformity trials, analysis of variance and interpretation of data, transformations, orthogonality and partitioning of degrees of freedom.

UNIT-II

Completely randomized design, randomized block design and Latin square design, repeated Latin square design, analysis of covariance and missing plot techniques in randomized block and Latin square designs.

UNIT-III

Factorial experiments (symmetrical as well as asymmetrical), confounding in symmetrical factorial experiments, factorial experiments with control treatment.

UNIT-IV

Split plot and strip plot designs, crossover designs, balanced incomplete block design, lattice design-concepts, randomization procedure, analysis and interpretation of results, experiments with mixtures.

Practical:

1. Analysis of data obtained from CRD, RBD, LSD
2. Analysis of factorial experiments with and without confounding
3. Analysis with missing data; balanced incomplete block design; split plot and strip plot designs; transformation of data
4. Analysis of lattice design.

Recommended books:

S. No	Name	Author(S)	Publisher
1	Statistical Method for Research workers	Singh, S, Singh, T.P Babsal, M.L and Kumar R	Kalyani Publishers, Ludhiana
2	Statistical methods for agricultural workers,	Panse, V.G., Shaw, F.J., and Sukhatme, P.V.	Indian Council of Agricultural Research,



Course Code	LIB501-18
Course Title	Library and Information Services
Type of course	Theory
L T P	0 0 1
Credits	1 (0 +1)
Course prerequisite	B.Sc (Agriculture)
Course Objectives (CO)	1.Educate and assist students in the identification and effective use of information resources 2. Provide current library materials and databases that support the academic curriculum

Syllabus

UNIT- I

Introduction to library services; Role of libraries in University education, research, extension and technology transfer;

UNIT- II

Classification systems and organization of Library; Sources of information Primary Sources, Secondary Sources and Tertiary Sources, with emphasis on reference tools and digital resources; Intricacies of abstracting and indexing, CAS, SDI services, (Science Citation Index, Biological Abstracts, Chemical Abstracts, CABI Abstracts etc.);

UNIT-III

Tracing information from reference sources, information explosion and language barrier; Literature survey; Citation techniques/Bibliographic control and Preparation of bibliography;

UNIT-IV

Use of CD-ROM Databases, Online Public Access Catalogue and other computerized library services; Use of Internet including search engines and its resources; e-abbreviations like ibid etc

Recommended books:

S.No.	Name	Author(S)	Publisher
1.	Manual of Library and Information Services	Bhanu Pratap	STUDERA PRESS



Course Code	CSE551-18
Course Title	COMPUTER FUNDAMENTALS AND PROGRAMMING
Type of course	Theory & Practical
L T P	2 0 1
Credits	3(2 +1)
Course prerequisite	B.Sc (Agriculture)/CSE
Course Objectives (CO)	To impart comprehensive knowledge about the computer fundamentals and programming

Syllabus

Theory

UNIT I

Computer Fundamentals- number system, decimal, octal, binary and hexadecimal representation of integers, fixed and floating point numbers, character representation ASCII,EBCDIC. Functional units of computer, I/O devices, primary and secondary memories.

UNIT-II

Programming fundamentals with C-algorithm, techniques of problem solving, flowcharting, stepwise refinement ,representation of integer, character, real, data types, constants and variables, arithmetic expressions, assignment statement, logical expression

UNIT-III

Sequencing, alteration and iteration, arrays, string processing

UNIT-IV

Sub programs, recursion, pointers and files. Program correctness, debugging and testing of programs .

Practical:

1. Conversion of different number types; creation of flow chart;
2. conversion of algorithm /flowchart to program; mathematical operators; operator precedence; sequence, control and iteration; arrays and string processing; pointers and file processing

Recommended books:

S.No.	Name	Author(S)	Publisher
1	Digital Logic and Computer Design.	MM. Mano 1999	Prentice Hall of India
2	Digital Computer Electronics	AP Malvino & JA.Brown 1999	Tata McGraw Hill



SEMESTER II

Course Code	AGR530-18
Course Title	BREEDING OF FRUIT CROPS
Type of course	Theory & Practical
L T P	2 0 1
Credits	2+ 1
Course prerequisite	B.Sc (Agriculture)
Course Objectives (CO)	To impart comprehensive knowledge about the principles and practices of breeding of fruit crops

Syllabus

Theory

Origin and distribution, taxonomical status - species and cultivars, cytogenetics, genetic resources, blossom biology, breeding systems, breeding objectives, ideotypes, approaches for crop improvement - introduction, selection, hybridization, mutation breeding, polyploid breeding, rootstock breeding, improvement of quality traits, resistance breeding for biotic and abiotic stresses, biotechnological interventions, achievements and future thrust in the following selected fruit crops.

Crops

UNIT I : Mango, banana , pineapple , Citrus, grapes, guava and sapota

UNIT II: Jackfruit, papaya, custard apple, aonla, avocado and ber

UNIT III: Mangosteen, litchi, jamun, phalsa, mulberry, raspberry, kokam and nuts

UNIT IV: Apple, pear, plums, peach, apricot, cherries and strawberry

Practical

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

Recommended books:

S.No.	Name	Author(S)	Publisher
1	Fundamental of Horticulture	Jitender singh	Kalyani
2	Fruit Breeding.	Janick J & Moore JN	John Wiley & Sons

Course Code	AGR532-18
Course Title	Biotechnology of Fruits Crops
Type of course	Theory
L T P	2 0 1
Credits	3(2+1)
Course prerequisite	B.Sc (Agriculture) or Life Sciences
Course Objectives (CO)	Understanding the principles, theoretical aspects and developing skills in biotechnology of horticultural crops

Syllabus

Theory

UNIT-I

Harnessing bio-technology in horticultural crops, influence of plant materials, physical, chemical factors and growth regulators on growth and development of plant cell, tissue and organ culture Callus culture – types, cell division, differentiation, morphogenesis, organogenesis, embryogenesis.

UNIT-II

Use of bioreactors and in vitro methods for production of secondary metabolites, suspension culture, nutrition of tissues and cells, regeneration of tissues, ex vitro, establishment of tissue cultured plants.

UNIT-III

Physiology of hardening - hardening and field transfer, organ culture – meristem, embryo, anther, ovule culture, embryo rescue, somaclonal variation, protoplast culture and fusion.

UNIT-IV

Construction and identification of somatic hybrids and cybrids, wide hybridization, in vitro pollination and fertilization, haploids, in vitro mutation, artificial seeds, cryopreservation, rapid clonal propagation, genetic engineering in horticulture crops, use of molecular markers. In vitro selection for biotic and abiotic stress, achievements of biotechnology in horticultural crops.

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Biotechnology of Horticultural Crops	V.A. Parthasarathy	Naya Prokash
2	Recent trends in biotechnology of horticultural crops	-	ICAR
3	Principle of gene manipulation	Primrose	Wiley



Course Code	AGR534-18
Course Title	Organic Horticulture
Type of course	Theory
L T P	1 0 1
Credits	2(1 + 1)
Course prerequisite	B.Sc (Agriculture)
Course Objectives (CO)	To familiarize procedure and methods of fruit growing & their fundamentals. To study packages and practices of planting orchard.

Syllabus

Theory

UNIT-I

Organic horticulture – definition, synonyms and misnomers, principles, methods, merits and demerits, Organic farming systems, components of organic horticultural systems, different organic inputs, their role in organic horticulture,

UNIT-II

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

UNIT-III

Weed management practices in organic farming, biological/natural control of pests and diseases, organic horticulture in quality improvement ,GAP-Principles and management, HACCP exercise, certification of organic products and systems, agencies involved at national and international levels, standards evolved by different agencies

UNIT-IV

Constraints in certification, organic horticulture and export, IFOAM and global scenario of organic movement, post-harvest management of organic produce.

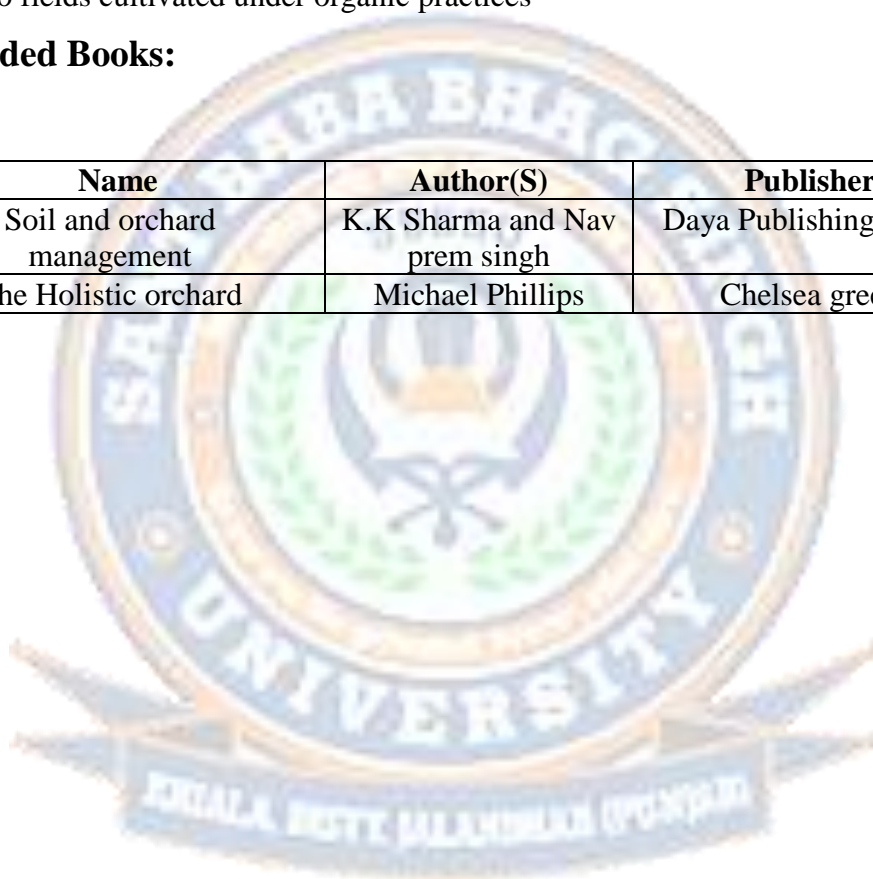
Practical

1. Features of organic orchards, working out conversion plan, Input analysis- manures, nutrient status assessment of manures,
2. Bio composting, biofertilizers and their application,
3. Panchagavya preparation and other organic nutrients application,

4. methods of preparation of compost, vermicompost, green manuring, preparation of neem products and application,
5. BD preparations and their role,
6. EM technology and products, biological/natural control of pests and diseases,
7. Soil solarization,
8. Frame work for GAP, case studies, HACCP analysis, residue analysis in organic products, documentation for certification,
9. Visit to fields cultivated under organic practices

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Soil and orchard management	K.K Sharma and Nav prem singh	Daya Publishing house
2	The Holistic orchard	Michael Phillips	Chelsea green



Course Code	AGR536-18
Course Title	GAP FOR HORTICULTURAL CROPS
Type Course	Theory & Practical
L T P	1 0 0
Credits	1(1 +0)
Course Pre-requisite	B.Sc (Agriculture)
Course Objective (CO)	To impart comprehensive knowledge about the principles and practices of Good Agricultural Practices (GAP) for horticultural crops.

SYLLABUS

Theory

UNIT I

Genesis of GAP – definition/description, components listed by FAO, frame work. Management of site history and soil, crop and fodder production, IPM, INM, IWM, irrigation water, crop production and protection

UNIT II

Identification of ways of improving the productivity profitability, and resource efficiency. harvest and post-harvest handling. Animal production, product certification, animal waste management, animal health and welfare, harvest.

UNIT III

On farm processing, storage, energy and waste management, human health, welfare, safety, wild life benefits.

UNIT IV

Institutions involved in GAP certification. Indian agencies, EUREPGAP (European Retail Producers Group- Good Agricultural Practices), EUREP etc.

Recommended books:-

S.No.	Name	Author(S)	Publisher
1	Basics in Horticulture.	Peter KV. 2008	New India Publ. Agency
2	Basic Horticulture	Jitender Singh	Kalyani

Course Code	AGR538-18
Course Title	Climate Management in horticultural production
Type Course	Theory & Practical
L T P	1 0 0
Credits	1(1 +0)
Course Pre-requisite	B.Sc (Agriculture)
Course Objective (CO)	To develop understanding about the impact and management of climate in horticultural production

SYLLABUS

Theory

UNIT I

Introduction to climate change. Factors directly connected to climate change, average temperature, change in rainfall amount and patterns, rising atmospheric concentrations of CO₂, pollution levels such as tropospheric ozone, change in climatic variability and extreme events like receding of glaciers in Himalayas.

UNIT II

Sensors for climate registration and crop monitoring, phytomonitoring and biosensors, plants response to the climate changes, premature bloom, marginally overwintering or inadequate winter chilling hours, insect pests, longer growing seasons and shifts in plant hardiness for perennial fruit crops, flowering plants and other plant species.

UNIT III

Impact of climate changes on invasive insect, disease, weed, pests, horticulture yield, quality and sustainability, climate management in field production – mulching - use of plastic-windbreak- spectral changes- frost protection. Climate management in greenhouse- heating - vents - CO₂ injection - screens - artificial light.

UNIT IV

Climate management for control of pests, diseases, quality, elongation of growth and other plant processes- closed production systems around the world. Special protected cultivation now and in the future, growth chambers, production in space, biosphere, future aspects of closed production, future greenhouse, use of LED as artificial light, future sensor types etc. clean development mechanism, role of tropical trees.

Recommended books:-

S.No.	Name	Author(S)	Publisher
1	Rao GSLHV	Climate Change and Agriculture over India.	ICAR
2	Rao GSLHV	Agricultural Meteorology	Prentice Hall



Course Code	AGR550-18
Course Title	Soil erosion and conservation
Type of course	Theory & Practical
L T P	2 0 1
Credits	3(2 +1)
Course prerequisite	B.Sc (Agriculture)
Course Objectives (CO)	To study the impact of erosion on soil, water and air quality and how to conserve soil erosion

Syllabus

Theory

UNIT I

History, distribution, identification and description of soil erosion problems in India. Forms of soil erosion, effects of soil erosion and factors affecting soil erosion, types and mechanisms of water erosion, raindrops and soil erosion, rainfall erosivity - estimation as EI30 index and kinetic energy, factors affecting water erosion, empirical and quantitative estimation of water erosion, methods of measurement and prediction of runoff, soil losses in relation to soil properties and precipitation.

UNIT II

Wind erosion- types, mechanism and factors affecting wind erosion, extent of problem in the country. Principles of erosion control, erosion control measures – agronomical and engineering, erosion control structures - their design and layout.

UNIT III

Soil conservation planning, land capability classification, soil conservation in special problem areas such as hilly, arid and semi-arid regions, waterlogged and wet lands.

UNIT IV

Watershed management - concept, objectives and approach, water harvesting and recycling, flood control in watershed management, socioeconomic aspects of watershed management, case studies in respect to monitoring and evaluation of watersheds, use of remote sensing in assessment and planning of watersheds.

Practical:

1. Determination of different soil erodibility indices - suspension percentage; dispersion ratio; erosion ratio; clay ratio; clay/moisture equivalent ratio; percolation ratio; raindrop erodibility index;
2. Computation of kinetic energy of falling rain drop
3. Computation of rainfall erosivity index using rain gauge data
4. Visits to a watershed.

Recommended books:-

S.No.	Name	Author(S)	Publisher
1	Soil Erosion and conservation	R.P.C. Morgan	Wiley Blackwill
2	Soil erosion and how to prevent it	Natalie Hyde	Crabtree Publishing Company



Course Code	AGR552-18
Course Title	Soil, water and air pollution
Type of course	Theory & Practical
L T P	2 0 1
Credits	3(2+1)
Course prerequisite	B.Sc (Agriculture)
Course Objectives (CO)	To study the pollution impact on soil, air & water and its remediation

Syllabus

Theory

UNIT I

Soil, water and air pollution problems associated with agriculture, nature and extent. Nature and sources of pollutants – agricultural, industrial, urban wastes, fertilizers and pesticides, acid rains, oil spills etc., air, water and soil pollutants - their CPC standards and effect on plants, animals and human beings.

UNIT II

Sewage and industrial effluents – their composition and effect on soil properties/health, and plant growth and human beings, soil as sink for waste disposal. Pesticides – their classification, behavior in soil and effect on soil microorganisms.

UNIT III

Toxic elements – their sources, behavior in soils, effect on nutrients availability, effect on plant and human health. Pollution of water resources due to leaching of nutrients and pesticides from soil, emission of greenhouse gases – carbon dioxide, methane and nitrous oxide.

UNIT IV

Remediation/amelioration of contaminated soil and water, remote sensing applications in monitoring and management of soil and water pollution.

Practical:

1. Sampling of sewage waters; sewage sludge; solid/liquid industrial wastes; polluted soils and plants
2. Estimation of dissolved and suspended solids; chemical oxygen demand (COD); biological oxygen demand (BOD); nitrate and ammonical nitrogen and phosphorus; heavy metal content in effluents; heavy metals in contaminated soils and plants.

Recommended books:-

S.No.	Name	Author(S)	Publisher
1	Soil Erosion and conservation	R.P.C. Morgan	Wiley Blackwill
2	Environment degradation and Global Health	Ashwani Kumar Dubey	Daya Publishing house



Course Code	AGR500-18
Course Title	Master's Research
Type of course	Practical
L T P	0 0 5
Credits	5 (0+ 5)
Course prerequisite	B.Sc (Agriculture)



SEMESTER-III

Course Code	AGR631-18
Course Title	Protected cultivation
Type of course	Theory & Practical
L T P	2 0 1
Credits	3(2+1)
Course prerequisite	B.Sc (Agriculture)
Course Objectives (CO)	Understanding the principles, theoretical aspects and developing skills in protected cultivation of fruit crops

Syllabus

UNIT-I

Greenhouse – World scenario, Indian situation: present and future, Different agro-climatic zones in India, Environmental factors and their effects on plant growth, Basics of greenhouse design, different types of structures – glasshouse, shade net, poly tunnels - Design and development of low cost greenhouse structures

UNIT-II

Interaction of light, temperature, humidity, CO₂, water on crop regulation - Greenhouse heating, cooling, ventilation and shading

UNIT-III

Types of ventilation- Forced cooling techniques - Glazing materials - Micro irrigation and Fertigation

UNIT-IV

Automated greenhouses, microcontrollers, waste water recycling, Management of pest and diseases – IPM

Practical

1. Designs of greenhouse, low cost poly tunnels, net house
2. Regulation of light, temperature, humidity in greenhouses, media
3. Greenhouse cooling systems, ventilation systems,
4. Fertigation systems, special management practices,
5. Project preparation for greenhouses
6. Visit to greenhouses

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Green House Operation and Management	Pant V Nelson	Bali
2	Advances in Protected Cultivation	Brahma Singh	New India Publishing Agency

Course Code	EVS 501-18
Course Title	Disaster Management
Type of course	Theory
L T P	1 0 0
Credits	1(1 +0)
Course prerequisite	B.Sc (Agriculture)
Course Objective(CO)	To introduce learners to the key concepts and practices of natural disaster management; to equip them to conduct thorough assessment of hazards, and risks vulnerability and capacity building

Syllabus

UNIT-I

Natural Disasters -Meaning and nature of natural disasters, their types and effects
Floods,drought,cyclone,earthquake,landslides,avalanches,volcanic eruptions, Heat and cold waves, climatic change: global warming, sea level rise, ozone depletion

UNIT-II

Manmade disasters-Nuclear disasters, chemical disasters, biological disasters , building fire, coal fire, forest fire, field fires-burning of straw, stables and residues oil fire, air pollution water pollution, deforestation, industrial waste water pollution, road accidents, rail accidents, sea accidents

UNIT-III

Disaster management-effect to mitigate natural disaster at national and global level, International strategy for disaster reduction, Concept of disaster management ,national disaster management framework; financial arrangements

UNIT-IV

Role of NGOs community-based organizations and media .Central, state, district and local administration; armed forces in disaster response, Disaster response ;Police and other organizations.

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Disaster Management future challenges and Opportunities	Jagbir singh	IK International Publishing House Pvt.Ltd.
2	National hazards and disaster management	R.B.Singh	UBS

Course Code	AGR 603-18
Course Title	Master's Seminar
Type of course	Practical
L T P	1 0 0
Credits	1(1 +0)
Course prerequisite	B.Sc (Agriculture)

Course Code	AGR605-18
Course Title	Master's Comprehensive Exam
Type of course	Practical
L T P	0 0 2
Credits	2(0 +2)
Course prerequisite	B.Sc (Agriculture)

Course Code	AGR601-18
Course Title	Master's Research
Type of course	Practical
L T P	0 0 5
Credits	5(0 + 5)
Course prerequisite	B.Sc (Agriculture)

SEMESTER-IV

Course Code	AGR600-18
Course Title	Master's Research
Type of course	Practical
L T P	0 0 10
Credits	10(0 + 10)
Course prerequisite	B.Sc (Agriculture)