SCHEME & SYLLABUS
M.Sc. (Hort.) Fruit Science
Programme Code: PG026

Department of Agriculture

UIS

Sant Baba Bhag Singh University

2025

Department of Agriculture, Sant Baba Bhag Singh University will follow recommendations, for naming Degrees, Course structure and minimum credit requirement as evolved by BSMA-Horticultural Sciences and Review meetings of NCG. which are as follows:

1. Degree nomenclature for in Postgraduate program of Fruit science in Horticulture is changed as per BASMA to

   M.Sc. (Hort.) Fruit Science

	Masters' Programme
i. Course work	
Major Courses	20
Minor Courses	08
Supporting Course(s)	06
Common compulsory courses/Inter Disciplinary Courses	06
Seminar	01
iii. Thesis/Research	30
Total	**71**

Major Courses: The courses in the Department/Discipline in which a student takes admission.
Minor Courses: The courses closely related to a student's major discipline (Horticultural Sciences).
Supporting Courses: The courses not related to the major discipline. It could be any course considered relevant for student's research work or necessary for building his overall competence.
Common Compulsory Courses: These following courses will be offered preferably as e- courses for all students undergoing Master's degree programme.

FRUIT SCIENCE

M. Sc. (Hort.) Fruit Science Course Structure- at a Glance

Code	Course	Cr Hrs
Major Courses (20 Credits)		
AGR531*	Tropical Fruit Production	2+1
AGR532*	Sub-Tropical and Temperate Fruit Production	2+1
AGR533*	Propagation and Nursery Management of Fruit Crops	2+1
AGR534*	Breeding of Fruit Crops	2+1
AGR535	Systematics of Fruit Crops	2+1
AGR536	Canopy Management in Fruit Crops	1+1
AGR537	Growth and Development of Fruit Crops	2+1
AGR538	Nutrition of Fruit Crops	2+1
AGR539	Biotechnology of Fruit Crops	2+1
AGR540	Organic Fruit Culture	2+1
AGR541	Export Oriented Fruit Production	2+1
AGR542	Climate Change and Fruit Crops	1+0
AGR543	Minor Fruit Production	2+1
Minor Courses		**08**
Supporting Courses		**06**
Common compulsory courses/Inter disciplinary courses		**07**
AGR599	Seminar	0+1
AGR595, AGR596 AGR597, AGR598	Research	0+30
	Total Credits	**72**

** Compulsory among major courses*

Common compulsory courses/Inter disciplinary courses		
Course No.	Course Title	Cr. Hr
LIB501	Library and Information Services	0+1
AGR592	Technical Writing and Communications Skills	0+1
BOT522	Intellectual Property and its Management in Agriculture	1+0
AGR590	Basic Concepts in Laboratory Techniques	0+1
AGR593	Agricultural Programmes Research, Research Ethics and Rural Development	1+0
EVS601	Disaster Management and Risk Management	2+0

INDEX

23	AGR597*	Master's Research	0+6	III	**51**
24	AGR599*	Master's Seminar	0+1	III	**50**
26	AGR598*	Master's Research	0+12	IV	**53**
27	AGR592	Technical Writing and Communications Skills	0+1	IV	**54-55**
28	AGR590	Basic Concepts in Laboratory Techniques	0+1	IV	**56-57**
29	AGR593	Agricultural Programmes Research, Research Ethics and Rural Development	1+0	IV	**58-59**

*Compulsory for Master's programme

SANT BABA BHAG SINGH UNIVERSITY, KHIALA -1430030, JALANDHAR

Institute Name:	**UIS**
Department Name:	**Agriculture**
Programme Name:	**M.Sc. Ag. Horticulture (Fruit Science)**
Number of Semetsers	**4**

Vision

1. To develop skilled students with basic and applied knowledge and skills of horticultural crops production & management protection and soil fertility management principles & concepts, fruit breeding
2. Enable the students to understand and realize problems in fruit crop production and seek solutions through exposure to research, extension and management.

Mission

1. To achieve excellence in the curriculum planning pertaining to Horticulture (Fruit Science) by periodically updating it in order to provide the students with sound technical knowledge.
2. To strengthen the research activities in fruit science by undertaking innovative and application-oriented projects for the development of Agricultural and allied sectors.
3. Generating knowledge and producing skilled manpower in the field of horticulture
4. Modernizing horticultural crop production sector by supplying it improved technologies i.e. improved seed or planting material, propagation techniques, optimum fertilization, irrigation etc.

Details of Programme Educational Objectives, Program Outcomes,Program Specific Outcomes

S.No.		Programme Educational Objective (PEO)
1	PEO1.	Train and develop scholars and promote research by providing students with contemporary concepts in various fields of crop Horticulture.
	PEO2.	Generate knowledge through training in cognitive, affective, and psychomotor, which are necessary for productive scholarly research in a selected area of Fruit science
	PEO3	Acquire in-depth knowledge in area(s) of specialization.
	PEO4	The program will contribute to the development of agricultural sector and thereby ensure food security and self-sufficiency.
2		**Programme Outcomes (PO)**
	PO1.	Specific knowledge of various courses specialized to their studies.
	PO2.	Detailed knowledge on the subject to improve the farmer's condition by their contributions.
	PO3	Detailed knowledge of cultivation practices of tropical, subtropical, temperate and arid region fruits, soil, fertilizers insect pest, economic associated with farming enterprises.
	PO4	Use appropriate scientific and statistical methods and evaluations for decision making in various sectors of agriculture.
3		**Programme Specific Outcomes (PSO)**
	PSO1.	Demonstrate use of written and oral communication skills.
	PSO2.	Understanding the basic concepts and theories and terminology of Fruit Science
	PSO3	Undertake teaching, research and offer administrative and consultancy services to organizations.
	PSO4	Apply research and expertise in solving or suggesting solutions to problems in the agricultural industry

LIST OF COURSE OFFEREDMAJOR COURSES

Sr. No.	Subject Code	Subject	Credit	Semester
1	AGR531*	Tropical Fruit Production	2+1	I
2	AGR532*	Sub-Tropical and Temperate Fruit Production	2+1	II
3	AGR533*	Propagation and Nursery Management of Fruit Crops	2+1	I
4	AGR534*	Breeding of Fruit Crops	2+1	II
5	AGR535	Systematics of Fruit Crops	2+1	I
6	AGR536	Canopy Management in Fruit Crops	1+1	II
7	AGR537	Growth and Development of Fruit Crops	2+1	I
8	AGR538	Nutrition of Fruit Crops	1+0	II
9	AGR539	Biotechnology of Fruit Crops	2+1	III
10	AGR540	Organic Fruit Culture	1+0	II
11	AGR541	Export Oriented Fruit Production	2+1	III
12	AGR542	Climate Change and Fruit Crops	2+1	II
13	AGR543	Minor Fruit Production	2+1	III
14	AGR595*	Master's Research	0+5	I
15	AGR596*	Master's Research	0+4	II
16	AGR597*	Master's Research	0+7	III
17	AGR599*	Master's Seminar	1+0	III
19	AGR598*	Master's Research	0+14	IV

Minor Courses				
1.	AGR550	Soil erosion and conservation	**2+1**	**II**
2.	AGR552	Soil, water and air pollution	**2+1**	**II**
3.				
Supporting Courses				
3.	MAT529	Experimental designs	**2+1**	**I**
4.	LIB601	Library and information Services	**0+1**	**I**
5.	CSE551	Computer fundamentals and programming	**2+1**	**I**
Compulsory for Master's program /Interdisciplinary Courses				
6.	EVS601	Disaster management and risk management	**2+0**	**III**
7.	BOT522	Intellectual property and its management in agriculture	**2+0**	**II**
8.	AGR602	Technical writing and communications skills	**0+1**	**IV**
9.	AGR593	Basic Concepts in Laboratory Techniques	**0+1**	**IV**
10.	AGR593	Agriculture research, research, ethics and rural development programme	**1+0**	**III**
11.	LIB501	Library and Information Services	**0+1**	**I**
*Compulsory for Master's program/Inter disciplinary courses				

CREDIT LOAD FOR MASTERS PROGRAM

I	**MAJOR CREDITS**	**20**
II	**MINOR CREDITS**	**08**
III	**SUPPORTING**	**06**
IV	**INTERDISCIPLINARY CREDITS\ COMMON COMPULSORY COURSES**	**08**
V	**MASTER'S SEMINAR**	**01**
VII	**MASTER'S RESEARCH**	**30**
TOTAL I to V		**40**
	TOTAL	**43+30 = 73**

M.Sc. (Hort.) Fruit Science scheme

SEMESTER-I							
Sr. No	**Subject Code**	**Type of Course**	**Subject Name**	**Credits (L:T:P)**	**Contact Hours (L:T:P)**	**Total Contact Hours**	**Total Credit Hours**
1	AGR531	CR	Tropical Fruit Production	2:0:1	2:0:2	4	3
2	AGR533	CR	Propagation and Nursery Management of Fruit Crops	2:0:1	2:0:2	4	3
3	MAT529	SC	Experimental designs	2:0:1	2:0:2	4	3
4	CSE004	SC	Computer fundamentals and Programming	2:0:1	2:0:2	4	3
5	LIB501	SC	Library and Information services	0:0:1	0:0:2	2	1
6	AGR595	CR	Master's Research	0:0:5	0:0:5	10	5

Total Credit Hours: 18
Total Contact Hours: 28

CC-Core Course
SC- Supporting Course

M.Sc. (Hort.) Fruit Science scheme

SEMESTER-II							
Sr. No.	**Subject Code**	**Type of course**	**Subject Name**	**Credits (L:T:P)**	**Contact Hours (L:T:P)**	**Total Contact Hours**	**Total Credit Hours**
1	AGR502	CR	Principles and practices of soil fertility and nutrient management	2:0:1	2:0:2	4	3
2	AGR532	CR	Sub-Tropical and Temperate Fruit Production	2:0:1	1:0:2	4	3
3	AGR550	MC	Soil erosion and Conservation	2:0:1	2:0:2	4	3
4	AGR552	MC	Soil, water and air Pollution	2:0:1	2:0:2	4	3
5	AGR536	CR	Canopy Management in Fruit Crops	1:0:1	1:0:2	3	2
6	AGR596	CR	Master's Research	0:0:4	0:0:8	4	4

Total Credit Hours: 18
Total Contact hrs: 27

CR-Core Course
MC- Minor Course
IC- Interdisciplinary Course
DEC- Departmental Elective Course

M.Sc. (Hort.) Fruit Science scheme

SEMESTER-III							
Sr. No.	**Subject Code**	**Type of course**	**Subject Name**	**Credits (L:T:P)**	**Contact Hours (L:T:P)**	**Total Contact Hours**	**Total Credit Hours**
1	AGR541	CR	Export Oriented Fruit Production	2:0:1	2:0:2	4	3
2	AGR539	CR	Biotechnology of Fruit Crops	2:0:1	2:0:2	4	3
3	AGR593	CC	Agriculture research, ethics and rural development Programme	1:0:0	1:0:0	1	1
4	EVS601	IC	Disaster Management and Risk management	2:0:0	2:0:0	2	2
5	AGR599	CR	Master's Seminar	1:0:0	1:0:0	1	1
6	AGR597	CR	Master's Research	0:0:8	0:0:14	14	7

Total Credit Hours: 18
Total Contact hours: 26

CR-Core Course
IC- Interdisciplinary Course
DEC- Departmental Elective Course
SC- Supporting Course

M.Sc. (Hort.) Fruit Science scheme

SEMESTER-IV							
Sr. No.	**Subject Code**	**Type of Course**	**Subject Name**	**Credits (L:T:P)**	**Contact Hours (L:T:P)**	**Total Contact Hours**	**Total Credit Hours**
1	AGR592	CC	Technical Writing and communication skills	0:0:1	0:0:2	2	1
2	AGR590	CC	Basic Concepts in Laboratory Techniques	0:0:1	0:0:2	2	1
3.	BOT522	IC	Intellectual Property Rights and management in agriculture	2:0:0	2:0:0	2	2
4	AGR598	CR	Master's Research	0:0:13	0:0:13	26	13

Total Credit Hours: 17

Total Contact hours: 32

CR-Core Courses
IC- Interdisciplinary Courses

Course Scheme Summary

Semester	L	T	P	Contact hrs/wk	Credits
1	8	0	5	28	18
2	11	0	9	22	18
3	6	0	9	28	18
4	1	0	9	31	16
Total	**28**	**0**	**36**	**109**	**70**

SEMESTER-I

Course Code	AGR531	
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.	
Course Outcomes	CO1	As with most crops, students will study the growing of these crops including: soils; plant establishment; cropping systems;
	CO2	Student will able to make orchard layout; tree management - pruning and training; nutrition; water management; managing plants in marginal climates
	CO3	Student will be able to know the supply chain of horticultural crops, including world and Indian production

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 importantcultivars,

2. Observations on growth and development, practices in growthregulation,
3. Maladydiagnosis,
4. Analyses of qualityattributes
5. Visit to tropical and arid zoneorchards,
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	
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 inIndia	
Course Outcomes	CO1	Student will be able to know cultivation practices a wide range of subtropical and temperate fruit crops
	CO2	Student will able to make orchard layout; tree management - pruning and training; nutrition; water management; managing plants in marginal climates
	CO3	Student will be able to know the supply chain of horticultural crops, including world and Indian production

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 importantcultivars
2. Observations on growth and development, practices in growthregulation
3. Maladydiagnosis
4. Analyses of qualityattributes

5. Visit to tropical, subtropical, humid tropical and temperateorchards
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	
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.	
Course Outcome	CO1	Student will understand the conservation and management strategy for biodiversity in India
	CO2	Student will be able to find out the area with high biodiversity means the area in which number of plants are present. After that this high biodiversity area should be covered in the form of natural park/ sanctuary/biosphere reserve etc. In this way biodiversity can be conserve in their natural habitat from human activities Biodiversity rich areas and hotspots
	CO3	Student will be able to know the plant quarantine procedure

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 coregroup.

UNIT-IV

Crops

Mango, sapota, citrus, guava, banana, papaya, grapes, jackfruit, custard, apple, ber, aonla, malus, Prunussp, 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 PGRactivities.
4. Detection of genetic constitution of germplasm, core sampling, germplasmcharacterization using moleculartechniques.

5. **Recommended Books:**
6.

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	**AGR539**	
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 fruitcrops	
Course Outcomes	CO1	students will be able to identify plant vegetative structure
	CO2	Students will be able to understand geometry of planting of fruitcrops
	CO3	Students will be able to know canopy management through rootstock andscion.

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 treecanopies.

UNIT III

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

UNIT IV

Canopy management through plant growth inhibitors, training and pruning and management practices**.**Canopydevelopment 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 differentcanopy types
2. Study of canopy development throughpruning
3. Use of plant growthinhibitors

4. Geometry ofplanting

5. Study on effect of different canopy types on production andquality 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 & ShikhamanySD	Malhotra Publ. House.

Course Code	**AGR541**	
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	
Course Outcomes	CO1	Students will be able to propagate fruit crops with various propagation techniques
	CO2	Students will be able to know seed quality, treatment, packing, storage, certification, testing.
	CO3	Students will be able to understand nursery structures and nursery management

Syllabus

Theory

UNITI

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

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 andmethods.

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 scionbank.

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 propaguleproduction.

Practical

1. Anatomical studies in rooting of cutting and graftunion
2. To study the construction of propagationstructures
3. study of media andPGR.
4. Hardening – case studies,micropropagation
5. . To study the explant preparation, mediapreparation
6. To study the culturing – *in vitro* clonal propagation, meristemculture
7. To study the shoot tip culture, axillarybud

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**	
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**.**	
Course Outcomes	CO1	Students will be able to understand growth dynamics of plants
	CO2	Students will be understand the biosynthesis of growth regulators
	CO3	Students will be understand molecular and genetic approaches in plant growth development.

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 photoperiodismvernalisation, 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, brasssinosteroids, 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.

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	MAT529	
Course Title	**Experimental designs**	
Type of Course	Theory	
L T P	2 0 1	
Credits	3 (2 +1)	
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.	
Course Outcomes	CO1	Students will understand the theory knowledge as well as practical knowledge of different formulas
	CO2	Analysis of data pertaining to attributes and to interpret the results.
	CO3	Making familiar with some elementary statistical methods of analysis of research data

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 controltreatment.

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 withoutconfounding
3. Analysis with missing data; balanced incomplete block design; split plot and strip plot

designs; transformation ofdata

4. Analysis of latticedesign.

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	**CSE004**	
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	
Course Outcomes	CO1	Students will be able to operate the Sequencing, alteration and iteration, arrays, string processing
	CO2	Students will be able to Computer programming Fundamentals
	CO3	Students will be to do conversion of different number types; creation of flowchart

Syllabus

Theory

UNITI

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, logicalexpression

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 flowchart;
2. conversion of algorithm /flowchart to program; mathematical operators; operator precedence; sequence, control and iteration; arrays and string processing; pointers and fileprocessing

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

Course Code	**AGR515**	
Course Title	**Master's Research**	
Type of course	Practical	
L T P	0 0 4	
Credits	4 (0 + 4)	
Course prerequisite	B.Sc (Agriculture)	
Course Outcomes	**CO1**	This program will provide students the theoretical and research backgrounds necessary to design, implement, and manage different cropping system.
	CO2	Students will conduct field trials.
	CO3	Collect, summarize and interpret data.

SEMESTER II

Course Code	AGR530	
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	
Course Outcomes	CO1	Upon completion of this course, student will Apply the basic principles of genetics and plant breeding for genetic improvement of plants
	CO2	Students will be able to use breeding methods for improvement of horticultural crops for quality and yields as per requirements of the growing population
	CO3	Students will able to use various selection techniques and methods that can be used in genetic improvement of self and cross pollinated 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 fruitcrops.

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, blossombiology
2. Study of anthesis, estimating fertilitystatus
3. Practices in hybridization, ploidy breeding, mutationbreeding
4. Evaluation of biometrical traits and qualitytraits

5. Screening for resistance, developing breeding programme for specifictraits
6. isit to research stations working on tropical, subtropical and temperate fruitimprovement

Recommended books:

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

Course Code	AGR532	
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	
Course Outcomes	CO1	Students will be able to use plant tissue culture techniques
	CO2	Students will be able to understand harnessing bio-technology in horticultural crops
	CO3	Students will be able to know achievements of biotechnology in 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	NayaProkash
2	Recent trends in biotechnology of horticultural crops	-	ICAR
3	Principle of gene manupulation	Primrose	Wiley

Course Code	**AGR534**	
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..	
Course outcomes	CO1	Students will be known to certification of organic products and systems, agencies involved at national and international levels, standards evolved by different agencies
	CO2	Students will be known to organic horticulture in quality improvement
	CO3	Students will be known constraints in certification, organic horticulture and export

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 ofmanures,
2. Bio composting, biofertilizers and their application,
3. Panchagavya preparation and other organic nutrientsapplication,

1. methods of preparation of compost, vermicompost, green manuring, preparation of neem products andapplication,
2. BD preparations and their role,
3. EM technology and products, biological/natural control of pests anddiseases,
4. Soilsolarization,
5. Frame work for GAP, case studies, HACCP analysis, residue analysis in organic products, documentation forcertification,
6. Visit to fields cultivated under organicpractices

Recommended Books:

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

Course Code	**AGR536**	
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.	
Course Outcomes	CO1	Students will be to understand Genesis of GAP
	CO2	Students will be to understand IPM, INM, IWM
	CO3	Students will be to know Institutions involved in GAP certification. Indian agencies,

SYLLABUS

Theory

UNITI

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**	
Course Title	**Climate Management in horticulturalproduction**	
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	
Course Outcomes	CO1	Students will be understand to know Sensors for climate registration and crop monitoring
	CO2	Students will be understand to know Impact of climate changes on invasive insect, disease, weed, pests, horticulture yield
	CO3	Students will be understand to know Special protected cultivation

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 inHimalayas.

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 plantspecies.

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**	
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	
Course Outcomes	CO1	To provide knowledge about waste land and problematic soils in India and management of the soils.
	CO2	Knowledge of different reclamation and management practices for the development of the soils.
	CO3	To Understand different factors responsible for saline ,sodic and acidic soils and their properties.

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 raindrop
3. Computation of rainfall erosivity index using rain gaugedata
4. Visits to awatershed.

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**	
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	
Course Outcosme	CO1	To aware the students about causes, effects and remedies to prevention and mitigation of soil pollution
	CO2	Students will be able to know remote sensing applications in monitoring and management of soil and water pollution.
	CO3	Students will be able to know Remediation/amelioration of contaminated soil and water,

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 andplants.

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	**BOT522**	
Course Title	Intellectual property and its management in agriculture	
Type of course	Theory	
L T P	2:0:0	
Credits	2(2+0)	
Course prerequisite	B.Sc. (Agriculture)	
Course Objectives	To equip students and stakeholders with knowledge of intellectual property rights (IPR) related protection systems, their significance and use of IPR as a tool for wealth and value creation in a knowledge-based economy.	
Course Outcomes	CO1	Students will be able to understand Historical perspectives and need for the introduction of Intellectual Property Right
	CO2	Students will be able to understand National Biodiversity protection initiatives. Convention on BiologicalDiversity.
	CO3	Students will be able to understand Research collaboration Agreement, License agreement

Syllabus

Theory

UNIT-I

Historical perspectives and need for the introduction of Intellectual Property Right regime. TRIPs and various provisions in TRIPS Agreement. Intellectual Property and Intellectual Property Rights (IPR), benefits of securing IPRs.

UNIT-II

Indian Legislations for the protection of various types of Intellectual Properties. Fundamentals of patents, copyrights, geographical indications, designs and layout, trade secrets and traditional knowledge, trademarks, protection of plant varieties and farmers' rights and biodiversity protection

UNIT-III

Protectable subject matters, protection in biotechnology, protection of other biological materials, ownership and period of protection. National Biodiversity protection initiatives. Convention on BiologicalDiversity.

UNIT-IV

International Treaty on Plant Genetic Resources for Food and Agriculture. Licensing of technologies, Material transfer agreements, Research collaboration Agreement, License Agreement.

Recommended books:

S. No	Name	Author(S)	Publisher
1	Law related to intellectual property	Dr. B.L. Wadehra	Universal law publishing
2	Law relating to intellectual property rights	V.K. Ahuja	Universal law publishing

Course Code	**AGR500**	
Course Title	**Master's Research**	
Type of course	Practical	
L T P	0 0 4	
Credits	4 (0+ 4)	
Course prerequisite	B.Sc (Agriculture)	
Course Outcomes	**CO1**	This program will provide students the theoretical and research backgrounds necessary to design, implement, and manage different cropping system.
	CO2	Students will conduct field trials.
	CO3	Collect, summarize and interpret data.

SEMESTER-III

Course Code	**EVS 601**	
Course Title	**Disaster Management and Risk Mangement**	
Type of course	Theory	
L T P	2 0 0	
Credits	2(2 +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	
Course Outcomes	CO1	Students will be able to understand the nature of natural disasters, their types and effects
	CO2	Students will be able to understand the nature of manmade disasters, their types and effects
	CO3	Students will be able to understand the role of NGOs

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, ozonedepletion

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	Jagbirsingh	IK International Publishing House Pvt.Ltd.
2	National hazards and disaster management	R.B.Singh	UBS

Course Code	LIB501	
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 useof informationresources 2. Provide current library materials and databases that supportthe academic curriculum	
Course Outcomes	CO1	Students will be able to understand the Role of libraries in University education
	CO2	, Students will be able to understand the sources of information
	CO3	Students will be able to understand the Citation techniques/Bibliographic control and Preparation of bibliography;

UNIT- I

Syllabus

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 likeibidetc

Recommended books:

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

Course Code	**AGR631**	
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	
Course Outcomes	CO1	After completion of this course, the students will acquire basic knowledge about the fundamental aspects of Protected cultivation horticulture
	CO2	Students will able to understand and identify different types of green houses and their importance
	CO3	Students will able to perform protected cultivation practices.

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 andFertigation

UNIT-IV

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

Practical

1. Designs of greenhouse, low cost poly tunnels, nethouse
2. Regulation of light, temperature, humidity in greenhouses,media
3. Greenhouse cooling systems, ventilationsystems,
4. Fertigation systems, special management practices,
5. Project preparation forgreenhouses

6. Visit togreenhouses

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	**AGR537**	
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.	
Course Outcomes	CO1	On completion of course the students will be able to Understand technologies of post-harvest technology and its role in providing better quality produce to the consumer
	CO2	Understand importance of prevention of losses Understand functional foods and nutraceuticals
	CO3	Students will be aware about the importance of Marketing linkage for fresh produce and processed products

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 horticulturalcrops,
2. Improved packing and storage of important horticulturalcommodities,
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 andvegetables,
5. Cold chain management - visit to cold storage and CA storageunits,
6. Visit to fruit and vegetable processing units, projectpreparation,
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	**AGR 603**	
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 Outcome	**CO1**	Students will demonstrate the ability to collaborate with others as they work on intellectual projects (reading, writing, speaking, researching...).
	CO2	Students will demonstrate the ability to follow discussions, oral arguments, and presentations, noting main points or evidence and tracking threads through different comments.
	CO3	Further, students will be able to challenge and offer substantive replies to others' arguments, comments, and questions, while remaining sensitive to the original speaker and the classroom audience.

Course Code	**AGR605**	
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 Outcomes	**CO1**	It will improve strong analytical, problem-solving and critical thinking abilities
	CO2	Depth knowledge of the discipline.
	CO3	Ability to communicate knowledge of the discipline

Course Code	**AGR601**	
Course Title	**Master's Research**	
Type of course	Practical	
L T P	0 0 4	
Credits	4 (0 + 4)	
Course prerequisite	B.Sc (Agriculture)	
Course Outcomes	**CO1**	This program will provide students the theoretical and research backgrounds necessary to design, implement, and manage different cropping system.
	CO2	Students will conduct field trials.
	CO3	Collect, summarize and interpret data.

SEMESTER-IV

Course Code	**AGR600**	
Course Title	**Master's Research**	
Type of course	Practical	
L T P	0 0 8	
Credits	8(0 + 8)	
Course prerequisite	B.Sc (Agriculture)	
Course Outcomes	**CO1**	This program will provide students the theoretical and research backgrounds necessary to design, implement, and manage different cropping system.
	CO2	Students will conduct field trials.
	CO3	Collect, summarize and interpret data.

Course Code	**AGR602**	
Course Title	Technical Writing and communications skills	
Type of course	Practical	
L T P	0:0:2	
Credits	1(0+1)	
Course prerequisite	B.Sc. (Agriculture)	
Course Objectives	To equip the students/scholars with skills to write dissertations, research papers, etc. To equip the students/scholars with skills to communicate and articulate in English (verbal as well as writing).	
Course Outcomes	CO1	Students will analyze basic communication skills.
	CO2	Students will be able to understand carious forms of scientific writings
	CO3	Students will analyze intercultural communication skills.

Practicals:

1. Various forms of scientific writings- thesis, technical papers, reviews, manuals, etc.
2. Various parts of thesis and research communications (title page, authorship contents page, preface, introduction, review of literature, material and methods, experimental results and discussion).
3. Writing of abstracts, summaries, précis, citations etc.
4. Commonly used abbreviations in the theses and research communications.
5. Illustrations, photographs and drawings with suitable captions.
6. Pagination, numbering of tables and illustrations.
7. Writing of numbers and dates in scientific write-ups. Editing and proof-reading.
8. Writing of a review article.
9. Grammar (Tenses, parts of speech, clauses, punctuation marks).
10. Error analysis (Common errors), concord, collocation.
11. Phonetic symbols and transcription, accentual pattern, weak forms in connected speech.
12. Participation in group discussion, facing an interview, presentation of scientific papers.

Recommended books:

S. No	Name	Author(S)	Publisher
1	Technical writing and communication: theory and practices	Deb DulalHalder, AnjanaNeiraDev&Prerna Malhotra	Book age publications

Course Code	AGR604	
Course Title	Human rights and constitutional duties	
Type of course	Theory	
L T P	1:0:0	
Credits	1(1+0)	
Course prerequisite	B.Sc. (Agriculture)	
Course Objectives	To study the human rights and its actual status	
Course Outcomes	CO1	By the end of the course students should be able to: Demonstrate a good understanding of the provisions under the Constitution of India dealing with human rights
	CO2	Display a good understanding of the nature and scope of special legislations dealing with protection of human rights of marginalized and vulnerable sections.
	CO3	Demonstrate a good understanding of the practical application of human rights law to specific human rights problems in India.

Syllabus

Theory

UNIT-I

Introduction to human rights. Foundational Aspects: Meaning, Nature, Classification**.** Evolution of the Concept: Magna Carta to Universal Declaration of Human Rights; Generations of Human Rights.

UNIT-II

Conceptual Perspective: Meaning, Nature & Characteristics of Human Duties; Classification of Human Duties; Relevance of Human Duties

Human Duties in India: Fundamental Duties in Indian Constitution Part IV A

(a) To abide by the Constitution and respect its ideals and institutions, the National Flagand the NationalAnthem;
(b) To cherish and follow the noble ideals which inspired our national struggle forfreedom;
(c) To uphold and protect the sovereignty, unity and integrity ofIndia;
(d) To defend the country and render national service when called upon to doso;
(e) To promote harmony and the spirit of common brotherhood amongst all the people of India transcending religious, linguistic and regional or sectional diversities; to renounce practices derogatory to the dignity ofwomen;
(f) To value and preserve the rich heritage of our compositeculture;
(g) To protect and improve the natural environment including forests, lakes, rivers andwild

life, and to have compassion for livingcreatures;

(h) To develop the scientific temper, humanism and the spirit of inquiry andreform;

(i) To safeguard public property and to abjureviolence;

(j) To strive towards excellence in all spheres of individual and collective activity sothat the nation constantly rises to higher levels of endeavour andachievement;

(k) Who is a parent or guardian to provide opportunities for education to his child or, asthe case may be, ward between the age of six and fourteenyears.)

UNIT-III

Concept of human rights in India. Constitutional-Legal Framework: Fundamental Rights; Directive Principles of State Policy Governmental Institutions for the Protection of Human Rights: Working of National Human Rights Commission; National Commission for Women.

UNIT-IV

Actual status of human rights in India. Status of Economic Social & Cultural Rights in India: Violence against Women; Violation of Child Rights: An Appraisal. State of Civil & Political Rights in India: A study of Jammu & Kashmir and the North-East.

Recommended books:

S. No	Name	Author(S)	Publisher
1	Introduction to Human Rights and Duties	S.N.Shastry	University of Pune Press, 2011
2	Human duties and limits of human right	Eric R Boot	Springer

Course Code	**AGR606**	
Course Title	Agriculture research, research, ethics and rural development programme	
Type of course	Theory	
L T P	1:0:0	
Credits	1(1+0)	
Course prerequisite	B.Sc. (Agriculture)	
Course Objectives	To sensitize the scholars about the basic issues related with agricultural Research, ethics in research as well as rural development.	
Course Outcomes	CO1	Students will understand the standards and problems in research ethics
	CO2	The students should have develop the decision making tools which can be implemented/performed during a critical situation
	CO3	The students become familiar with the typical life of the rural mass and their livelihood patterns.

Syllabus

Theory

UNIT-I

History of agriculture in brief. Global agricultural research system: need, scope, opportunities. Role in promoting food security, reducing poverty and protecting the environment. National Agricultural Research Systems (NARS) and Regional Agricultural Research Institutions. Consultative Group on International Agricultural Research (CGIAR): International Agricultural ResearchCentres (IARC), partnership with NARS, role as a partner in the global agricultural research system, strengthening capacities at national and regional levels. International fellowships for scientificmobility.

UNIT-II

Research ethics: research integrity, research safety in laboratories, welfare of animals used in research, computer ethics, standards and problems in research ethics.

UNIT-IIIse

Concept and connotations of rural development, rural development policies and strategies. Rural development programmes: Community Development Programme. Intensive Agricultural District Programme, Special group – Area Specific Programme, Integrated Rural Development Programme(IRDP).

UNIT-IV

Panchayati Raj, Institutions, Co-operatives, Voluntary Agencies/Non-Governmental Organisations. Critical evaluation of rural development policies and programmes. Constraints in implementation of rural policies andprogrammes.

Recommended books:

S. No	Name	Author(S)	Publisher
1.	Rural Development- Principles, Policies and Management.	K Singh	Sage Publ.
2.	Manual on International Research and Research Ethics	M.S. Punia	CCS, Haryana Agricultural University, Hisar.