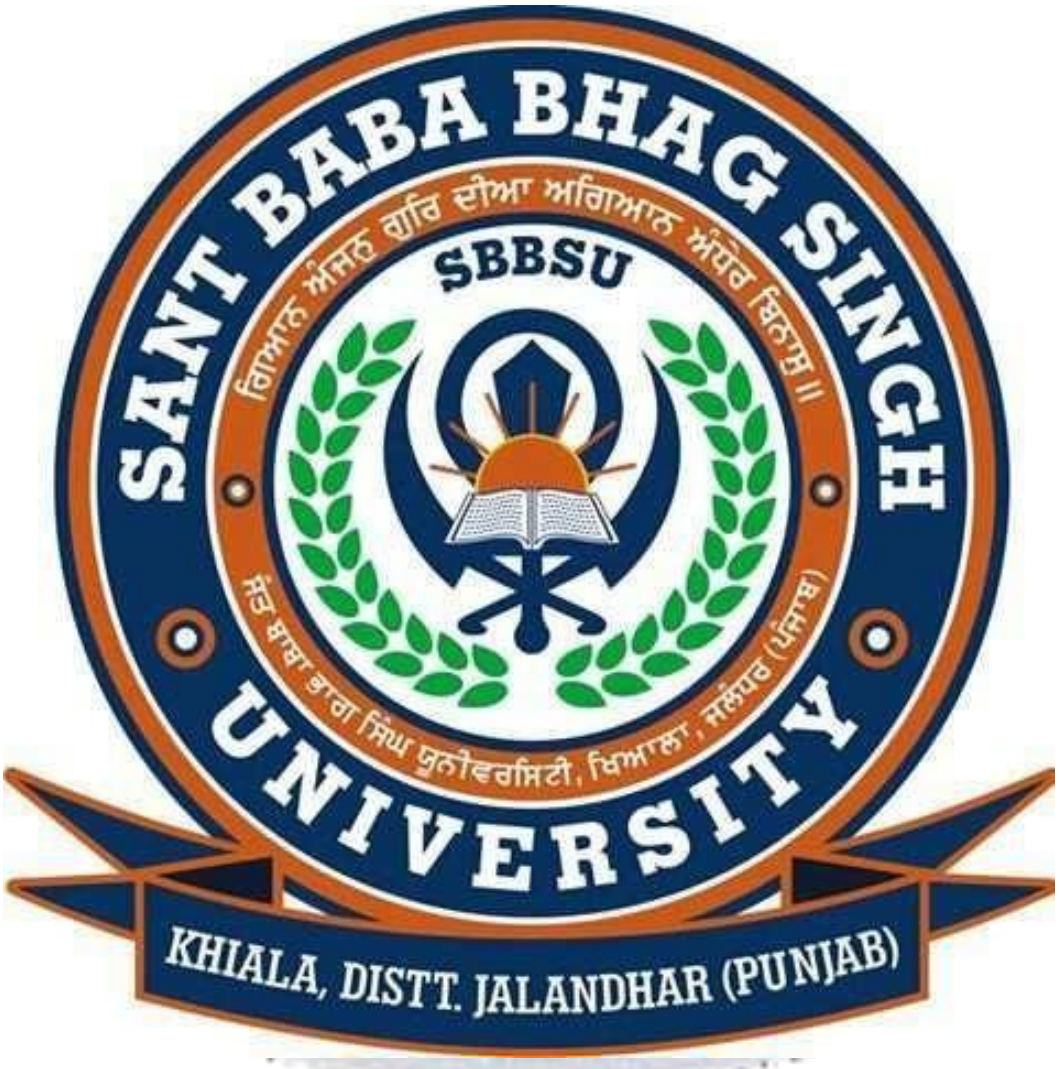
SCHEME & SYLLABUS
M.Sc. Ag. Horticulture (Vegetable Science)



Department of Agriculture

UISH

Sant Baba Bhag Singh University

2020

SANT BABA BHAG SINGH UNIVERSITY, KHIALA -1430030, JALANDHAR

Institute Name:	**UISH**
Department Name:	**Agricultural Sciences**
Programme Name:	**M.Sc. Ag. Horticulture (Vegetable Science)**
Number of Semesters	**4**

Vision:

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

Mission:

1. To achieve excellence in the curriculum planning pertaining to Horticulture (Vegetable Science) by periodically updating it in order to provide the students with sound technical knowledge.
2. To strengthen the research activities in vegetable 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 (Vegetable science).
4. Modernizing vegetable 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 Vegetable 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.	Programme deals with the production aspects of vegetable crops at commercial level, seed production, and hybrid seed development, breeding approach in vegetables, organic vegetable production and protected cultivation of vegetable crops. Programme provides complete solution to the problems associated with development of vegetable production as industry.
	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 and 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 vegetable 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

INDEX

23	AGR604	Human rights and constitutional duties	**1+0**	**IV**	**46-47**
24	AGR606	Agriculture research, research, ethics and rural development programme	**1+0**	**IV**	**48-49**

*Compulsory for Master's programme

List of Courses Offered				
Sr. No.	**Subject Code**	**Subject**	**Credit**	**Semester**
Major Courses				
1.	AGR570*	Production technology of warm season vegetable crops	2+1	II
2.	AGR571*	Production technology of cool season vegetable crops	2+1	I
3.	AGR572*	Breeding of vegetable crops	2+1	II
4.	AGR573*	Growth and development of vegetable crops	2+1	I
5.	AGR574	Production technology of underexploited vegetable crops	2	II
6.	AGR575	Systematics of vegetable crops		I
7.	AGR515*	Master's Research	0+4	I
8.	AGR577	Seed production technology of vegetable crops		III
9.	AGR579	Post harvest technology of vegetable crops	2+1	III
10.	AGR500*	Master's Research	0+4	II
11.	EVS601	Disaster Management	1+0	III
12.	AGR601*	Master's Research	0+4	III
13.	AGR603*	Master's Seminar	1+0	III
14.	AGR605*	Master Comprehensive	0+2	III
15.	AGR600*	Master's Research	0+8	IV

Minor Courses				
1.	AGR550	Soil erosion and conservation	**2+1**	**II**
2.	AGR552	Soil, water and air pollution	**2+1**	**II**
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**
Interdisciplinary Courses				
6.	EVS601	Disaster management	**1+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.	AGR604	Human rights and constitutional duties	**1+0**	**IV**
10.	AGR606	Agriculture research, research, ethics and rural development programme	**1+0**	**IV**
*Compulsory for Master's program				

CREDIT LOAD FOR MASTERS PROGRAM

I	**MAJOR CREDITS**	**22**
II	**MINOR CREDITS**	**06**
III	**SUPPORTING**	**07**
IV	**INTERDISCIPLINARY CREDITS**	**06**
V	**MASTER'S COMPREHENSIVE**	**02**
VI	**MASTER'S SEMINAR**	**01**
VII	**MASTER'S RESEARCH**	**20**
TOTAL I to VI		**44**
	TOTAL	**44+20 = 64**

M. Sc. Ag. Horticulture (Vegetable 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	AGR571	CR	Production technology of cool season vegetable crops	2:0:1	2:0:2	4	3
2	AGR573	CR	Growth and developmentof vegetablecrops	2:0:1	2:0:2	4	3
3	AGR575	CR	Systematicsof vegetablecrops	1:0:1	1:0:2	3	2
4	MAT529	SC	Experimental designs	2:0:1	2:0:2	4	3
5	CSE551	SC	Computer fundamentals and programming	2:0:1	2:0:2	4	3
6	AGR515	CR	Master's Research	0:0:4	0:0:8	8	4

Total Credit Hours: 18
Total Contact Hours: 27

CR-Core Course
SC- Supporting Course

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	AGR570	DEC	Production technology of warm season vegetable crops	2:0:1	2:0:2	4	3
2	AGR572	CR	Breeding of vegetable crops	2:0:1	2:0:2	4	3
3	AGR574	DEC	Production technology of underexploited vegetable crops	1:0:1	1:0:2	3	2
4	AGR550	MC	Soil erosion and conservation	2:0:1	2:0:2	4	3
5	AGR552	MC	Soil, water and air pollution	2:0:1	2:0:2	4	3
6	AGR500	CR	Master's Research	0:0:4	0:0:8	8	4
7	BOT522	IC	Intellectual Property Rights	2:0:0	2:0:0	2	2

Total Credit Hours: 20
Total Contact hrs: 29

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

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	EVS501	IC	Disaster management	1:0:0	1:0:0	1	1
2	AGR577	DEC	Seed production technology of vegetable crops	2:0:1	2:0:2	4	3
3	LIB501	SC	Library and information services	0:0:1	0:0:2	2	1
4	AGR579	CR	Post harvest technology of vegetable crops	2:0:1	2:0:2	4	3
5	AGR603	CR	Master's Seminar	1:0:0	1:0:0	1	1
6	AGR605	CR	Master's Comprehensive	0:0:2	0:0:4	4	2
7	AGR601	CR	Master's Research	0:0:4	0:0:8	8	4

Total Credit Hours: 15
Total Contact hours: 24

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

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	AGR600	CR	Masters Research	0:0:8	0:0:16	16	8
2	AGR602	IC	Technical Writing and communication skills	0:0:1	0:0:2	2	1
3	AGR604	IC	Human rights and constitutional duties	1:0:0	1:0:0	1	1
4	AGR606	IC	Agriculture research, ethics and rural development programme	1:0:0	1:0:0	1	1

Total Credit Hours: 11
Total Contact hours: 20

CR-Core Courses
IC- Interdisciplinary Courses

Course Scheme Summary

Semester	L	T	P	Contact hrs/wk	Credits
1	9	-	18	27	18
2	11	-	18	29	20
3	6	-	18	24	15
4	1	-	18	20	11
Total	**27**	**0**	**72**	**100**	**64**

SEMESTER-I

Course Code	**AGR571**	
Course Title	**Production technology for cool season vegetable crops**	
Type of course	Theory & Practical	
L T P	2 0 1	
Credits	3 (2 +1)	
Course prerequisite	B.Sc (Agriculture)	
Course objectives (CO)	To educate production technology of cool season vegetables.	
Course Outcomes	CO1	Through this course students should be able to describe the production technology of temperate vegetable crops. .
	CO2	devise cropping scheme and plan for commercial vegetable production
	CO3	apply knowledge of intercultural practices for improving yield of vegetable crops. develop skills for growing temperate vegetable crops.

Syllabus

Theory

Introduction, botany and taxonomy, climatic and soil requirements, commercial varieties/hybrids, sowing/planting times and methods, seed rate and seed treatment, nutritional and irrigation requirements, intercultural operations, weed control, mulching, physiological disorders, harvesting, post-harvest management, plant protection measures and seed production of:

Crops

UNIT I- Potato

UNIT II- Cole crops: cabbage, cauliflower, knoll kohl, sprouting broccoli, Brussels sprout

UNIT III- Root crops: carrot, radish, turnip and beetroot

UNIT IV- Bulb crops: onion and garlic

UNIT V- Peas and broad bean, green leafy cool season vegetables

Practical

1. Cultural operations (fertilizer application, sowing, mulching, irrigation, weed control) of winter vegetable crops and theireconomics
2. Experiments to demonstrate the role of mineralelements
3. Plant growth substances and herbicides

4. Study of physiological disorders,
5. Preparation of cropping scheme for commercialfarms.
6. visit to commercial greenhouse/polyhouse

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	Vegetable Production in India	DVS Chauhan	Ram Parsad & Sons
2	Hand Book of Horticulture	K L Chadha	ICAR
3	Package and Practices of Vegetables	-	PAU

Course Code	**AGR573**	
Course Title	**Growth and development of vegetable 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 teach the physiology of growth and development of vegetable crops.	
Course Outcomes	CO1	**Through this course students should be able to** define the pattern of plant growth and development in vegetable crops.
	CO2	illustrate the mechanism of plant dormancy and plant physiology in vegetable crops.
	CO3	apply plant growth regulators in vegetable crops for increasing quality production.

Syllabus

UNIT-I

Cellular structures and their functions; definition of growth and development, growth analysis and its importance in vegetable production.

UNIT-II

Physiology of dormancy and germination of vegetable seeds, tubers and bulbs; Role of auxins, gibberellilns, cyktokinins and abscissic acid; Application of synthetic hormones, plant growth retardants and inhibitors for various purposes in vegetable crops; Role and mode of action of morphactins, antitranspirants, anti-auxin, ripening retardant and plant stimulants in vegetable crop production.

UNIT-III

Role of light, temperature and photoperiod on growth,development of underground parts, flowering and sex expression in vegetable crops; apicaldominance.

UNIT-IV

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

UNIT- V

Plant growth regulators in relation to vegetable production; morphogenesis and tissue culture techniques in vegetable crops.

Practical

1. Preparation of solutions of plant growth substances and theirapplication
2. Experiments in breaking and induction of dormancy bychemicals
3. Induction of parthenocarpy and fruitripening
4. Application of plant growth substances for improving flower initiation, changing sex expression in cucurbits and checking flower and fruit drops and improving fruit set in solanaceous vegetables,
5. Growth analysis techniques in vegetablecrops

Recommended books:-

S.No.	Name	Author(S)	Publisher
1	Application Plant Growth Substances and Their Uses in Agriculture	HN Krishnamoorti	Tata-McGraw Hill

Course Code	**AGR575**	
Course Title	**Systematics of vegetable 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 teach morphological, cytological and molecular taxonomy of vegetable crops.	
Course Outcome	CO1	Students will be able to understand cytological levels of various vegetable crops
	CO2	Students will understand role of molecular markers in improvement of vegetable crops
	CO3	Students will be understand the interaction of vegetable crops with their environment.

Syllabus

Theory

UNITI

Principles of classification; different methods of classification; salient features of international code of nomenclature of vegetable crops

UNIT II

Origin, history, evolution and distribution of vegetable crops, botanical description of families, genera and species covering various tropical, subtropical and temperate vegetables.

UNIT III

Cytological level of various vegetable crops; descriptive keys for important vegetables

UNIT IV

Importance of molecular markers in evolution of vegetable crops; molecular markers as an aid in characterization and taxonomy of vegetable crops.

Practical

1. Identification, description, classification and maintenance of vegetable species andvarieties
2. Survey, collection of allied species and genera locallyavailable
3. Preparation of keys to the species andvarieties
4. Methods of preparation of herbarium andspecimens.

Recommended books:-

S.No.	Name	Author(S)	Publisher
1	Genetics and Breeding of Vegetables. (Revised)	Peter KV & Pradeep kumar T.	ICAR
2	A Class Book of Botany	Dutta AC	Oxford Univ. Press.

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	**CSE551**	
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	AGR570	
Course Title	**Production technology for warm season vegetable crops**	
Type of course	Theory & Practical	
L T P	2 0 1	
Credits	2 +1	
Course prerequisite	B.Sc (Agriculture)	
Course objectives (CO)	To teach production technology of warm season vegetables.	
Course Outcomes	CO1	**Through this course students should be able to** discuss the importance and production technology of warm season vegetables. enumerate physiological disorders and their management of warm season vegetables.
	CO2	identify and manage biotic and abiotic factors causing problems in crop production.
	CO3	describe harvesting indices and methods in warm season vegetables.

Syllabus

Theory

Introduction, botany and taxonomy, climatic and soil requirements, commercial varieties/hybrids, sowing/planting times and methods, seed rate and seed treatment, nutritional and irrigation requirements, intercultural operations, weed control, mulching, physiological disorders, harvesting, post harvest management, plant protection measures, economics of crop production and seed production of:

UNIT I- Tomato, eggplant, hot and sweet peppers
UNIT II- Okra, beans, cowpea and clusterbean
UNIT III- Cucurbitaceous crops
UNIT IV- Tapioca and sweet potato
UNIT V - Green leafy warm season vegetables

Practical

1. Maturity Standards, Cultural operations (fertilizer application, sowing, mulching, irrigation, weed control) of summer vegetable crops and theireconomics
2. Study of physiological disorders and deficiency of mineralelements
3. Preparation of cropping schemes for commercialfarms
4. Experiments to demonstrate the role of mineralelements
5. Plant growth substances and herbicides
6. Seed extractiontechniques
7. Identification of important pests and diseases and theircontrol

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	Vegetable Production in India	DVS Chauhan	Ram Parsad & Sons
2	Hand Book of Horticulture	-	ICAR
3	Package and Practices of Vegetables	-	PAU

Course Code	AGR572	
Course Title	**Breeding of Vegetable Crops**	
Type of course	Theory & Practical	
L T P	2 0 1	
Credits	2 +1	
Course prerequisite	B.Sc (Agriculture)	
Course Objectives (CO)	To educate principles and practices adopted for breeding of vegetable crops	
Course Outcomes	CO1	**Through this course students should be able to** describe principles and practices adopted for breeding of vegetable crops.
	CO2	discuss breeding techniques and achievements in vegetable crops.
	CO3	apply advance techniques of breeding in vegetable crops.

Syllabus

Theory:

Origin, botany, taxonomy, cytogenetics, genetics, breeding objectives, breeding methods (introduction, selection, hybridization, mutation), varieties and varietal characterization, resistance breeding for biotic and abiotic stress, quality improvement, molecular marker, genomics, marker assisted breeding and QTLs, biotechnology and their use in breeding in vegetable crops-Issue of patenting, PPVFR act.

UNIT I- Potato and tomato
UNIT II- Eggplant, hot pepper, sweet pepper and okra
UNIT III- Peas and beans, amaranth, chenopods and lettuce
UNIT IV- Gourds, melons, pumpkins and squashes
UNIT V- Cabbage, cauliflower, carrot, beetroot, radish, sweet potato and tapioca

Practical

1. Selection of desirable plants from breeding population observations and analysis of various qualitative and quantitative traits ingermplasm
2. Hybrids and segregatinggenerations
3. Induction of flowering, palanological studies, selfing and crossing techniques in vegetablecrops
4. Hybrid seed production of vegetable crops inbulk.
5. Screening techniques for insect-pests, disease and environmental stress resistance in vegetables crops
6. Demonstration of sib-mating and mixedpopulation
7. Molecular marker techniques to identify useful traits in the vegetable crops and special breeding technique.

Recommended Books:

S.No.	Name	Author(S)	Publisher
1	Techniques of developing hybrids in vegetable crops	Kumar JC & Dhaliwal MS	Agro Botanical
2	Genetics and breeding of vegetables	K V Peter and T. Pardeep Kumar	ICAR

Course Code	**AGR574**	
Course Title	**Production technology of underexploited vegetable 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 educate production technology of underutilized vegetable crops.	
Course Outcomes	CO1	**Through this course students should be able to** discuss the importance and production technology of underexploited vegetables. enumerate physiological disorders and their management of warm season vegetables.
	CO2	identify and manage biotic and abiotic factors causing problems in crop production.
	CO3	describe harvesting indices and methods in warm season vegetables.

Syllabus

Theory

Introduction, botany and taxonomy, climatic and soil requirements, commercial varieties/hybrids, sowing/planting times and methods, seed rate and seed treatment, nutritional and irrigation requirements, intercultural operations, weed control, mulching, physiological disorders, harvesting, post harvest management, plant protection measures and seed production of:

UNIT I

Asparagus, artichoke and leek

UNIT II

Brussels's sprout, Chinese cabbage, broccoli, kale and artichoke.

UNIT III

Amaranth, celery, parsley, parsnip, lettuce, rhubarb, spinach, basella, bathu (chenopods) and chekurmanis

UNIT IV

Elephant foot yam, lima bean, winged bean, vegetable pigeon pea, jack bean and sword bean

UNIT V

Sweet gourd, spine gourd, pointed gourd, Oriental pickling melon and little gourd (kundru).

Practical

1. Identification ofseeds
2. Botanical description ofplants
3. Layout andplanting
4. Cultural practices
5. **Recommended books:-**
6.

S.No.	Name	Author(S)	Publisher
1	Unexploited Tropical Vegetables	Indira P & Peter KV.	
2	Underutilized and Underexploited Horticultural Crops.	Peter KV. (Ed.).	New India Publ. Agency.

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 Outcomes	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

2.

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 Outcome	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	**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 Outcome	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

SEMESTER-III

Course Code	**AGR577**	
Course Title	**Seed production technologyof vegetable 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 educate principles and methods of quality seed and planting material production in vegetable crops	
Course Outcomes	CO1	Students will learn about production of delicate vegetable seeds
	CO2	They will learn the new technology to produce more yield in vegetable
	CO3	They will learn the diverse way of cultivation

Syllabus

Theory

UNIT I

Definition of seed and its quality, new seed policies; DUS test, scope of vegetable seed industry in India

UNIT II

Genetical and agronomical principles of seed production; methods of seed production; use of growth regulators and chemicals in vegetable seed production; floral biology, pollination, breeding behaviour, seed development and maturation; methods of hybrid seed production.

UNIT III

Categories of seed; maintenance of nucleus, foundation and certified seed; seed certification, seed standards; seed act and law enforcement, plant quarantine and quality control.

UNIT IV

Physiological maturity, seed harvesting, extraction, curing, drying, grading, seed processing, seed coating and pelleting, packaging (containers/packets), storage and cryopreservation of seeds, synthetic seed technology

UNIT V

Agro-techniques for seed production in solanaceous vegetables, cucurbits, leguminous vegetables, cole crops, bulb crops, leafy vegetables, okra, vegetatively propagated vegetables.

Practical

1. Seed sampling, seed testing (genetic purity, seed viability, seedling vigour, physical purity)and seed healthtesting
2. Testing, releasing and notification procedures ofvarieties
3. Floral biology; rouging ofoff-type

4. Methods of hybrid seed production in important vegetable and spicecrops
5. Seed extractiontechniques
6. Handling of seed processing and seedtesting

Recommended books:-

S.No.	Name	Author(S)	Publisher
1	Techniques in Seed Science and Technology	Agrawal PK & Dadlani M.	South Asian Publication
2	Techniques of Developing Hybrids in Vegetable Crops	Kumar JC & Dhaliwal MS	Agro Botanical Publication

Course Code	**AGR579**	
Course Title	**Post Harvest Technology of vegetable 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 educate principles and practices of processing of vegetable 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

History of food preservation. Present status and future prospects of vegetable preservation industry in India.

UNIT-II

Spoilage of fresh and processed horticultural produce; biochemical changes and enzymes associated with spoilage of horticultural produce; principal spoilage organisms, food poisoning and their control measures. Role of microorganisms in foodpreservation.

UNIT-III

Raw materials for processing. Primary and minimal processing; processing equipments; Layout and establishment of processing industry, FPO licence. Importance of hygiene; Plant sanitation. Quality assurance and quality control, TQM, GMP. Food standards – FPO,PFA, etc. Food laws and regulations.

UNIT-IV

Food safety – Hazard analysis and critical control points (HACCP). Labeling and labeling act, nutrition labeling. Major value added products from vegetables.Utilization of byproducts of vegetable processing

industry; Management of waste from processing factory. Investment analysis. Principles and methods of sensory evaluation of fresh and processed vegetables.

Practical:

1. Study of machinery and equipments used in processing of horticulturalproduce;
2. Chemical analysis for nutritive value of fresh and processedvegetables;
3. Study of different types of spoilages in fresh as well as processed horticulturalproduce;
4. Classification and identification of spoilageorganisms;
5. Study of biochemical changes and enzymes associated withspoilage;
6. Laboratory examination of vegetable products; Sensory evaluation of fresh and processed vegetablesStudy of food standards – National, international, CODEXAlimentarius;
7. Visit to processing Sections to study the layout, equipments, hygiene, sanitation and residual/ wastemanagement

Recommended books:-

S.No.	Name	Author(S)	Publisher
1	Post Harvest Physiology and Storage of horticultural crops	Mitra SK.	CABI

8. ;

Course Code	**EVS 601**	
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	
Course Outcome	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	Jagbir singh	IK International Publishing House Pvt.Ltd.
2	National hazards and disaster management	R.B.Singh	UBS

Course Code	LIB601	
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 Outcome	CO1	**Through this course students should be able to** Trace information from libraries efficiently.
	CO2	Apprise the information and knowledge resources
	CO3	Use modern tools like internet, OPAC, search engines etc for information searching.

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 likeibid etc

Recommended books:

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

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 anddiscussion).
3. Writing of abstracts, summaries, précis, citationsetc.
4. Commonly used abbreviations in the theses and researchcommunications.
5. Illustrations, photographs and drawings with suitable captions.
6. Pagination, numbering of tables andillustrations.
7. Writing of numbers and dates in scientific write-ups. Editing andproof-reading.
8. Writing of a reviewarticle.
9. Grammar (Tenses, parts of speech, clauses, punctuationmarks).
10. Error analysis (Common errors), concord,collocation.
11. Phonetic symbols and transcription, accentual pattern, weak forms in connectedspeech.
12. Participation in group discussion, facing an interview, presentation of scientificpapers.

Recommended books:

S. No	Name	Author(S)	Publisher
1	Technical writing and communication: theory and practices	Deb Dulal Halder, Anjana Neira Dev & 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, as the 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	**Through this course students should be able to** analyze the pros and cons of the Indian agricultural system
	CO2	describe the rural development status and programmes in India
	CO3	extend their knowledge of agricultural research ethics

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 Research Centres (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-III

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.