

**SCHEME : SCHOOL OF AGRICULTURE
COURSE: MASTER OF SCIENCE (AGRICULTURE)
BRANCH: HORTICULTURE(VEGETABLE SCIENCE)
DURATION: 4 SEMESTERS (2 Years)**

Course Structure of M.Sc. (Ag.) HORTICULTURE(VEGETABLE SCIENCE)

I SEMESTER

Course Details		Theory Assessment			Internal Assessment				Credit Distribution			Credits	
Course Code	Course Type	Course Title	Total Marks	Major Max Marks	Major Min Marks	Sessional Max Marks	Sessional Min Marks	Practical Max Marks	Practical Min Marks	L	T		P
MHVS20S501	Major Course	Production Technology of Cool Season Vegetable Crops	150	80	48	20	12	50	30	2	-	1	3(2+1)
MHVS20S502	Major Course	Organic Vegetable Production Technology	150	80	48	20	12	50	30	1	-	1	2(1+1)
MHVS20S503	Major Course	Production Technology of Under Exploited Vegetable	150	80	48	20	12	50	30	2	-	1	3(2+1)
MPPH20S501	Minor Course	Principles of Plant Physiology	150	80	48	20	12	50	30	3	-	1	4(3+1)
MPPB20S501	Minor Course	Principles of Plant Breeding	150	80	48	20	12	50	30	2	-	1	3(2+1)
MSTA20S511	Supporting Course	Statistical Methods in Applied Sciences	150	80	48	20	12	50	30	3	-	1	4(3+1)
MPGS20S501	Non-Credit Course	Library and Information Services	50	-	-	-	-	50	30	0	-	1	1(0+1)
MPGS20S502	Non-Credit Course	Basic Concepts in Laboratory Techniques	50	-	-	-	-	50	30	0	-	1	1(0+1)
MPGS20S506	Non-Credit Course	Intellectual Property and Its Management in Agriculture	100	80	48	20	12	-	-	1	-	0	1(1+0)
Grand Total			1100							14		8	

L- Lectures T- Tutorials P- Practical

Minimum Passing Marks = 60%

Major- Term End Theory Exam

Minor- Pre University Test

**SCHEME : SCHOOL OF AGRICULTURE
COURSE: MASTER OF SCIENCE (AGRICULTURE)
BRANCH: HORTICULTURE(VEGETABLE SCIENCE)
DURATION: 4 SEMESTERS (2 Years)**

Course Structure of M.Sc. (Ag.) HORTICULTURE(VEGETABLE SCIENCE)

II SEMESTER

Course Details

Course Code	Course Type	Course Title	Total Marks	Theory Assessment			Internal Assessment						Credit Distribution			Credits
				Major		Sessional		Practical		L	T	P				
				Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks							
MHVS20S504	Major Course	Production Technology of Warm Season Vegetable Crops	150	80	48	20	12	50	30	2	-	1	3(2+1)			
MHVS20S505	Major Course	Breeding of Vegetable Crops	150	80	48	20	12	50	30	2	-	1	3(2+1)			
MHVS20S506	Major Course	Fundamentals of Processing of Vegetable	150	80	48	20	12	50	30	1	-	1	2(1+1)			
MHVS20S507	Major Course	Growth and Development of Vegetable Crops	150	80	48	20	12	50	30	2	-	1	3(2+1)			
MPPH20S503	Minor Course	Hormonal and Regulation of Plant Growth and Development	150	80	48	20	12	50	30	2	-	1	3(2+1)			
MSTA20S512	Supporting Course	Statistics - II Experimental Design	150	80	48	20	12	50	30	2	-	1	3(2+1)			
MPGS20S503	Non-Credit Course	Agriculture Research, Research Ethics and Rural Development	100	80	48	20	12	-	-	1	-	0	1(1+0)			
MPGS20S504	Non-Credit Course	Disaster Management	100	80	48	20	12	-	-	1	-	0	1(1+0)			
MPGS20S505	Non-Credit Course	Technical Writing and Communication Skills	50	-	-	-	-	50	30	0	-	1	1(0+1)			
	Grand Total		1150							13		7				

L- Lectures T- Tutorials P- Practical

Minimum Passing Marks = 60%

Major- Term End Theory Exam

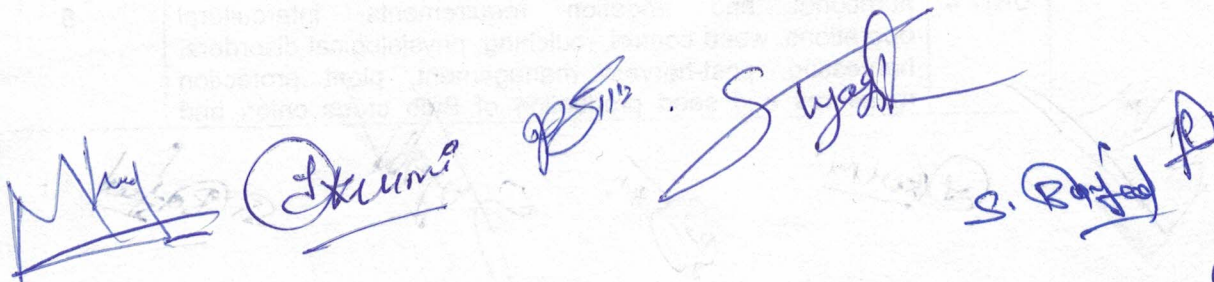
Minor- Pre University Test

M.Sc. (Ag.) Horticulture

Vegetable Science

Semester I

Course	Course Title	Subject code	Credits
Major Courses	Production technology of cool season vegetablecrops	MHVS20S501	3 (2+1)
	Organic Vegetable production Technology	MHVS20S502	2 (1+1)
	Production technology of under exploited vegetables	MHVS20S503	3 (2+1)
Minor Courses	Principles of Plant Physiology	MPPH20S501	4 (3 + 1)
	Principles of Plant Breeding	MPPB20S501	3 (2+1)
Supporting Courses	Statistical Methods in Applied Science	MSTA20S511	4 (3 + 1)
Compulsory Non-Credit Courses	Library and information services	MPGS20S501	1 (0 +1)
	Basic concepts in laboratory techniques	MPGS20S502	1 (0 +1)
	Intellectual Property and Its Management in Agriculture	MPGS20S506	1 (1 +0)



Class			M.Sc. (Agriculture)		
Year/Semester			1 st Year, 1 st Semester		
Department			Horticulture (Vegetable Science)		
Paper Name			Production technology of cool season: vegetable crops		
Subject Code			MHVS20S501		
L	T	P	Credit Total	3(2+1)	
2	0	1			
<p>Course Objectives: The course is aimed at</p> <ol style="list-style-type: none"> 1. Demonstrating the fundamental production technology of vegetables 2. Imparting knowledge on management technology of vegetables 3. Imparting practical experience on production technology of vegetables <p>Expected Course Outcomes: At the end of the course the student should be able to</p> <ol style="list-style-type: none"> 1. Appreciate the importance of cultivating vegetables 2. Demonstrate ideas on cultivating vegetables 3. Understand the physiological disorders undermining the yield of vegetables 4. Plan for commercial cultivation of vegetables 5. Cultivate and demonstrate marketing of vegetables 					
Unit		Syllabus			Periods
UNIT 1		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 Potato			5
UNIT 2		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 Cole crops cabbage, cauliflower, knoll kohlrabi, sprouting broccoli, Brusselssprout			6
UNIT 3		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 Root crops carrot, radish, turnip and beetroot			7
UNIT 4		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 Bulb crops onion and			6

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	garlic	
UNIT 5	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 Peas and broad bean, green leafy cool season vegetables	6

Practical (30 Periods)

Cultural operations (fertilizer application, sowing, mulching, irrigation, weed control) of winter vegetable crops and their economics. Experiments to demonstrate the role of mineral elements, plant growth substances and herbicides. Study of physiological disorders; preparation of cropping scheme for commercial farms. Visit to commercial greenhouse/ polyhouse.

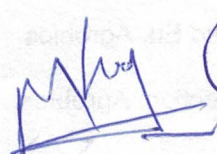


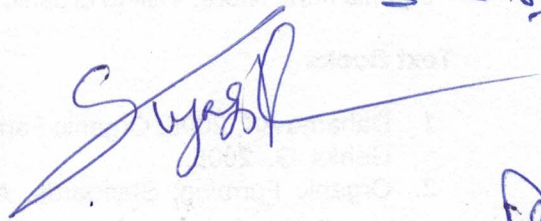


Text Books

1. Bose TK & Som MG. (Eds.). 1986. Vegetable Crops in India. Naya Prokash. Bose TK, Som G & Kabir J. (Eds.). 2002.
2. Vegetable Crops. Naya Prokash. Bose TK, Som MG & Kabir J. (Eds.). 1993.
3. Vegetable Crops. Naya Prokash. Bose TK, Kabir J, Maity TK, Parthasarathy VA & Som MG. 2003.
4. Fageria MS, Choudhary BR & Dhaka RS. 2000. Vegetable Crops Production Technology. Vol. II. Kalyani.

Reference Books

1. Chadha KL & Kalloo G. (Eds.). 1993-94. Advances in Horticulture Vols.V-X. Malhotra Publ. House.
2. Chadha KL. (Ed.). 2002. Hand Book of Horticulture. ICAR.
3. Chauhan DVS. (Ed.). 1986. Vegetable Production in India. Ram Prasad & Sons. Decoteau DR. 2000. Vegetable Crops. Prentice Hall.
4. Edmond JB, Musser AM & Andrews FS. 1951. Fundamentals of Horticulture. Blakiston Co.
5. Gopalakrishanan TR. 2007. Vegetable Crops. New India Publ. Agency.

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Class			M.Sc. (Agriculture)	
Year/Semester			1 st Year, 1 st Semester	
Department			Horticulture (Vegetable Science)	
Paper Name			Organic vegetable production technology	
Subject Code			MHVS20S502	
L	T	P	Credit Total	2(1+1)
1	0	1		
<p>Course Objectives: The course is aimed at</p> <ol style="list-style-type: none"> 1. Imparting knowledge on the scope and concepts of organic farming of vegetables in India 2. Discussing on indigenous weed, pest, disease and nutrient management for organic farming of vegetables 3. Educating students on the certification and marketing of organic farm produces of vegetables <p>Expected Course Outcome: At the end of the course the student should be able to</p> <ol style="list-style-type: none"> 1. Analyze the scope of organic farming of vegetables 2. Recommend varieties suitable for organic farming of vegetables 3. Comprehend management practices suitable for organic farming of vegetables 4. Understand processing and marketing of organic products of vegetables 5. Develop entrepreneur skills and ideas to practice organic farming 				
Unit	Syllabus			Periods
UNIT 1	Importance, principles, perspective, concept and component of organic production of vegetable crops.			2
UNIT 2	Organic production of vegetables crops, viz., solanaceous crops, cucurbits, cole crops, root and tuber crops.			2
UNIT 3	Managing soil fertility, pests and diseases and weed problems in organic farming system; crop rotation in organic horticulture; processing and quality control for organic foods.			4
UNIT 4	Methods for enhancing soil fertility, mulching, raising green manure crops. Indigenous methods of compost, Panchagavya, Biodynamics, preparation etc Pest and disease management in organic farming; ITK's in organic farming. Role of botanicals and bio-control agents.			5
UNIT 5	GAP and GMP- Certification of organic products; organic production and export - opportunity and challenges.			2

Practical (30 Periods)

Method of preparation of compost, vermicomposting, biofertilizers, soil solarization. Bio pesticides in horticulture, green manuring, mycorrhizae and organic crop production. Waste management, organic soil amendment for root disease, weed management in organic horticulture. Visit to organic fields and marketing centers.

Text Books

1. Dahama AK. 2005. Organic Farming for Sustainable Agriculture. 2nd Ed. Agrobios. Gehlot G. 2005.
2. Organic Farming; Standards, Accreditation Certification and Inspection. Agrobios.

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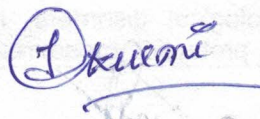
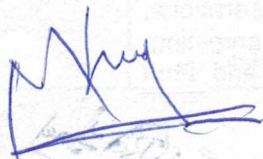
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3. Shivashankar K. 1997. Food Security in Harmony with Nature. 3rd IFOAMASIA, Scientific Conf.. 1- 4 December, 1997, UAS, Bangalore.

Reference Books

1. Palaniappan SP & Annadorai K. 2003. Organic Farming, Theory and Practice. Scientific Publ.
2. Pradeepkumar T, Suma B, Jyothibhaskar & Satheesan KN. 2008. Management of Horticultural Crops. New India Publ. Agency.



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Class			M.Sc. (Agriculture)	
Year/Semester			1 st Year, 1 st Semester	
Department			Horticulture (Vegetable Science)	
Paper Name			Production technology of under exploited vegetables	
Subject Code			MHVS20S503	
L	T	P	Credit Total	3(2+1)
2	0	1		
<p>Course Objectives: The course is aimed at</p> <ol style="list-style-type: none"> 1. Imparting knowledge on the types of farming systems of vegetables 2. Describing cropping systems and state the importance of sustainable vegetable production 3. Explaining integrated farming of vegetables and field crops <p>Expected Course Outcome: At the end of the course the student should be able to</p> <ol style="list-style-type: none"> 1. Interpret farming systems and its significance 2. Design an efficient vegetables cropping system 3. Demonstrate sustainability in agriculture 4. Propose integrated farming systems 5. Determine the efficiency of farming systems 				
Unit	Syllabus			Periods
UNIT 1	Introduction, botany and taxonomy, climatic and soil requirements, commercial varieties / hybrids, sowing / planting times and methods, seedrate 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 Asparagus, artichoke and leek			6
UNIT 2	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 Brussels's sprout, Chinese cabbage, broccoli, kale and artichoke.			6
UNIT 3	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 Amaranth, celery, parsley, parsnip, lettuce, rhubarb, spinach, basella, bathu(chenopods) and chekurmanis.			8
UNIT 4	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			5

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	production of Elephant foot yam, lima bean, winged bean, vegetable pigeon pea, jack bean and sword bean.	
UNIT 5	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 Sweet gourd, spine gourd, pointed gourd, Oriental pickling melon and littlegourd (kundru).	5

Practical (30 Periods)

Identification of seeds. Botanical. description of plants; Layout and planting; cultural practices; Short-term experiments of underexploited vegetables.

Text Books

1. Bhat KL. 2001. Minor Vegetables - Untapped Potential. Kalyani.
2. Indira P & Peter KV. 1984. Unexploited Tropical Vegetables. Kerala Agricultural University, Kerala.
3. Srivastava U, Mahajan RK, Gangopadyay KK, Singh M & Dhillon BS. 2001. Minimal Descriptors of Agri-Horticultural Crops. Part-II Vegetable Crops. NBPGR, New Delhi.

References

1. Rubatzky VE & Yamaguchi M. (Eds.). 1997. World Vegetables Principles, Production and Nutritive Values. Chapman & Hall
2. Peter KV. (Ed.). 2007-08. Underutilized and Underexploited Horticultural Crops. Vols. I-IV. New India Publ. Agency.

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SCHOOL OF AGRICULTURE

Class			M.Sc. (Agriculture)	
Year/Semester			1 st Year, 1 st Semester	
Department			Horticulture (Vegetable Science)	
Paper Name			Principles of plant physiology	
Subject Code			MPPH20S501	
L	T	P	Credit Total	3(3+0)
3	0	0		
<p>Course Objectives: The course is aimed at</p> <ol style="list-style-type: none"> 1. Instilling information on basic plant physiological functions, processes and its importance in crop production. 2. Infusing knowledge on growth and development, and to make the students understand how 3. Knowledge about these concepts has led to improved productivity in modern agriculture. 4. Imparting knowledge on remedy measures involved in solving plant physiological problems. <p>Expected Course Outcome: At the end of the course the student should be able to</p> <ol style="list-style-type: none"> 1. Define different physiological process at plant and cellular level 2. Summarize mechanisms of uptake, transport and translocation of water and nutrients. 3. Distinguish carbon cycles in plants and define lipid metabolism 4. Relate the importance of growth regulators in plant growth 5. Explain nutrient deficiencies and physiological requirements of plants 6. Interpret and measure plant physiological data 				
Unit		Syllabus		Periods
UNIT 1		Cell organelles and their physiological functions, structure and physiological functions of cell wall, cell inclusions; cell membrane structure and functions. Soil and plant water relations, water and its role in plants, properties and functions of water in the cell water relations-cell water terminology, water potential of plant cells.		8
UNIT 2		Water loss from plants-Energy balance-Solar energy input-energy dissipation at crop canopy level- evapotranspiration transpiration –Driving force for transpiration, plant factors influencing transpiration rate, Mycorrhizal association on water uptake. Stomata structure and function – mechanism of stomatal movement, antitranspirants.		10
UNIT 3		Physiology of water stress in plants: Influence of water stress at cell, organ, plant and canopy levels. Indices for assessment of drought resistance. Uptake of mineral elements in plants – Mechanisms of uptake-translocation of minerals in plants. The role of mineral nutrients in plant metabolism, critical levels, deficiency symptoms, nutrient deficiency and toxicity. Foliar nutrition.		10
UNIT 4		Photosynthesis and its importance in bio productivity. Photochemical process, photochemical reactions, CO ₂ reduction in Calvin cycle, supplementary pathway of C fixation in C ₄ and CAM plants and its significance. Photorespiration and		10

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	its relevance. Photosynthesis as a diffusive process effect of environmental factors on photosynthetic rates, Translocation of photosynthates and its importance in sink growth. Mitochondrial respiration, growth and maintenance respiration, cyanide resistant respiration and its significance.	
UNIT 5	Nitrogen metabolism: Inorganic nitrogen species (N ₂ , NO ₃ and NH ₃) and their reduction to aminoacids, protein synthesis and nucleic acids. Growth and differentiation. Hormonal concept of growth and differentiation, plant growth hormones and their physiological role synthetic growth regulators, growth retardants., Apical dominance, senescence, fruit growth, abscission. Photo morphogenesis: Photo receptors, phytochrome, cryptochrome, physiology of flowering- Photoperiodism and Vernalisation.	7


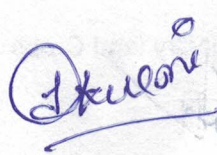

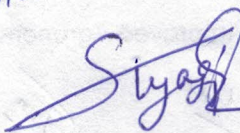


Text Books

1. Lincoln Taiz, Eduardo Zeiger, Ian M. Moller, and Angus Murphy. 2018. Plant Physiology and Development, International Sixth Edition. Sinauer; Oxford University Press; USA.
2. Frank B. Salisbury. 2006. Plant physiology. 4th edition. Sinauer Associates, Inc., USA.

Reference Books

1. Mohr, H and P. Schopfer. 1995. Plant physiology, Springer-Verlag, Germany.
2. Buchanan. B. B. 2015. Biochemistry and Molecular Biology of Plants. 2nd Edition. Wiley-Blackwell, USA.
3. Willey, N. 2016. Environmental Plant Physiology, 1st Edition, Garland Science, Taylor and Francis Group, LLC, UK.

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Class			M.Sc. (Agriculture)		
Year/Semester			1 st Year, 1 st Semester		
Department			Horticulture (Vegetable Science)		
Paper Name			Dryland farming and watershed management		
Subject Code			MAGR20S503		
L	T	P	Credit Total	3(2+1)	
2	0	1			
<p>Course Objectives: The course is aimed at</p> <ol style="list-style-type: none"> 1. Explaining the problems faced in rainfed agricultural systems 2. Imparting knowledge on drought management strategies 3. Describing watershed management techniques <p>Expected Course Outcome: At the end of the course the student should be able to</p> <ol style="list-style-type: none"> 1. Build knowledge on solving problems related to rainfed agriculture 2. Identify several drought management strategies 3. Plan crop and water management approaches to mitigate drought 4. Perceive the necessity and difficulties of watershed management 5. Recommend practices to be followed in rainfed farming systems 					
Unit	Syllabus				Periods
UNIT 1	Definition, concept and characteristics of dry land farming; dry land versus rainfed farming; significance and dimensions of dry land farming in Indian agriculture.				3
UNIT 2	Soil and climatic parameters with special emphasis on rainfall characteristics; constraints limiting crop production in dry land areas; types of drought, characterization of environment for water availability; crop planning for erratic and aberrant weather conditions.				6
UNIT 3	Stress physiology and resistance to drought, adaptation of crop plants to drought, drought management strategies; preparation of appropriate crop plans for dry land areas; mid contingent plan for aberrant weather conditions.				6
UNIT 4	Tillage, tillage, frequency and depth of cultivation, compaction in soil tillage; concept of conservation tillage; tillage in relation to weed control and moisture conservation; techniques and practices of soil moisture conservation (use of mulches, kinds, effectiveness and economics); antitranspirants; soil and crop management techniques, seeding and efficient fertilizer use.				10
UNIT 5	Concept of watershed resource management, problems, approach and components.				5

Practical (30 Periods)

Seed treatment, seed germination and crop establishment in relation to soil moisture contents
Moisture stress effects and recovery behaviour of important crops Estimation of moisture index and aridity index. Spray of anti-transpirants and their effect on crops. Collection and interpretation of data for water balance equations Water use efficiency. Preparation of crop plans for different drought conditions Study of field experiments relevant to dryland farming
Visit to dryland research stations and watershed projects.

Text Books

1. Singh RP. 1988. Improved Agronomic Practices for Dry, land Crops. CRIDA.

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2. Singh RP. 2005. Sustainable Development of Dry land Agriculture in India. Scientific Publ.

Reference Books

1. Singh SD. 1998. Arid Land Irrigation and Ecological Management. Scientific Publishers.
2. Venkateswarlu J. 2004. Rainfed Agriculture in India. Research and Development Scenario. ICAR.

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SCHOOL OF AGRICULTURE

Class	M.Sc. (Agriculture)		
Year/Semester	1 st Year, 1 st Semester		
Department	Horticulture (Vegetable Science)		
Paper Name	Statistical methods for applied sciences		
Subject Code	MSTA20S511		
L	T	P	Credit Total
3	0	1	
			4(3+1)

Course Objectives: The course is aimed at

1. Explaining the role of statistics in agriculture
2. Imparting knowledge on collection, analysis and presentation of data
3. Interpreting simple agricultural experiments

Expected Course Outcome: After completing the course, the student should be able to

1. Present and analyze scientific data
2. Solve problems on probability
3. Interpret statistical test outcomes
4. Design and analyze experiments
5. Appreciate the applications of statistical methods in science and engineering
6. Apply relevant statistical analysis to experimental data

Unit	Syllabus	Periods
UNIT 1	Classification, tabulation and graphical representation of data. Box-plot, Descriptive statistics. Exploratory data analysis; Theory of probability. Random variable and mathematical expectation.	5
UNIT 2	Discrete and continuous probability distributions Binomial, Poisson, Negative Binomial, Normal distribution, Beta and Gamma distributions and their applications. Concept of sampling distribution chi-square, <i>t</i> and <i>F</i> distributions. Tests of significance based on Normal, chi-square, <i>t</i> and <i>F</i> distributions. Large sample theory	8
UNIT 3	Introduction to theory of estimation and confidence-intervals. Correlation and regression. Simple and multiple linear regression model, estimation of parameters, predicted values and residuals, correlation, partial correlation coefficient, multiple correlation coefficient, rank correlation, test of significance of correlation coefficient and regression coefficients. Coefficient of determination. Polynomial regression models and their fitting. Probit regression analysis by least squares and maximum likelihood methods, confidence interval for sensitivity; Testing for heterogeneity.	12
UNIT 4	Non-parametric tests-sign, Wilcoxon, Mann-Whitney U-test, Wald Wolfowitz run test, Run test for the randomness of a sequence. Median test, Kruskal- Wallis test, Friedman two-way ANOVA by ranks. Kendall's coefficient of concordance.	7
UNIT 5	Introduction to multivariate analytical tools- Hotelling's T ² Tests of hypothesis about the mean vector of a multinormal population. Classificatory problems and discriminant function, D ² -statistic and its applications; Cluster analysis, principal component analysis, canonical correlations and Factor analysis.	8

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Practical (30 Periods)

1. Exploratory data analysis, Box-Cox plots; Fitting of distributions~Binomial, Poisson, Negative Binomial, Normal.
2. Large sample tests, testing of hypothesis based on exact sampling distributions~chi square, t and F; Confidence interval estimation and point estimation of parameters of binomial, Poisson and Normal distribution.
3. Correlation and regression analysis, fitting of orthogonal polynomial regression; applications of dimensionality reduction and discriminant function analysis; Nonparametric tests.

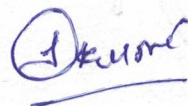
Text Books

1. Rangaswamy, R. 2016. A textbook of agricultural statistics. New Age International (P) Ltd., India.
2. Gupta, B.N. 2015. Statistical Analysis. SBPD Publications, India.


Reference Books

1. Peck, R., C. Olsen and J.L. Devore. 2008. Introduction to Statistics and Data Analysis, 5th edition. Brooks Cole Publishing Company, USA.
2. Salkand, N.J. 2016. Statistics for People Who (Think They) Hate Statistics. 6th Edition. Sage Publications. India.













Class			M.Sc. (Agriculture)
Year/Semester			1 st Year, 1 st Semester
Department			Horticulture (Vegetable Science)
Paper Name			Library and information services
Subject Code			MPGS20S501
L	T	P	Credit Total
0	0	1	
1(0+1)			
Course Objectives			
<ol style="list-style-type: none"> 1. To equip the library users with skills to trace information from libraries efficiently. 2. To apprise them of information and knowledge resources 3. To carry out literature survey, to formulate information search strategies, and to use modern tools (Internet, OPAC, search engines etc.) of information search. 			
Expected Course Outcome:			
<ol style="list-style-type: none"> 1. Creation good librarians who can manage and handle a big library. 			

Practical (30 Periods)

Introduction to library and its services; Role of libraries in education, research and technology transfer; Classification systems and organization of library; Sources of information- Primary Sources, Secondary Sources and Tertiary Sources; Intricacies of abstracting and indexing services (Science Citation Index, Biological Abstracts, Chemical Abstracts, CABI Abstracts, etc.); Tracing information from reference sources; Literature survey; Citation techniques/Preparation of bibliography; Use of CD-ROM Databases, Online Public Access Catalogue and other computerized library services; Use of Internet including search engines and its resources; e- resources access methods.

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Class			M.Sc. (Agriculture)	
Year/Semester			1 st Year, 1 st Semester	
Department			Horticulture (Vegetable Science)	
Paper Name			Basic concepts in laboratory techniques	
Subject Code			MPGS20S502	
L	T	P	Credit Total	1(0+1)
0	0	1		
Course Objectives: The course is aimed at <ol style="list-style-type: none"> 1. Describing the importance of plant tissue culture 2. Imparting knowledge on the applications and commercial importance of <i>in vitro</i> propagation 3. Introducing the role of tissue culture in plant breeding 				
Expected Course Outcome: At the end of the course the student should be able to <ol style="list-style-type: none"> 1. Understand how <i>in vitro</i> culture originated and appreciate its applications 2. Comprehend the various types of plant tissue culture and its importance 3. Demonstrate mass multiplication of micropropagules 4. Apply tissue culture techniques in crop improvement 5. Examine the demands of the plant tissue culture industry 6. Practice plant tissue culture techniques and become an entrepreneur 				

Practical (15 Periods)

Safety measures while in Lab Handling of chemical substances; Use of burettes, pipettes, measuring cylinders, flasks, separatory funnel, condensers, micropipettes and vaccumets; washing, drying and sterilization of glassware; Drying of solvents/chemicals. Weighing and preparation of solutions of different strengths and their dilution; Handling techniques of solutions; Preparation of different agro-chemical doses in field and pot applications; Preparation of solutions of acids; Neutralisation of acid and bases; Preparation of buffers of different strengths and pH values. Use and handling of microscope, laminar flow, vacuum pumps, viscometer, thermometer, magnetic stirrer, micro-ovens, incubators, sand bath, water bath, oil bath; Electric wiring and earthing. Preparation of media and methods of sterilization; Seed viability testing, testing of pollen viability; Tissue culture of crop plants; Description of flowering plants in botanical terms in relation to taxonomy

Text Books

1. Chawala H.S. 2000. Introduction to Plant Biotechnology. Oxford & IBH Publishing Co. Pvt. Ltd.
2. Chopra VL & Nasim A. 1990. Genetic Engineering and Biotechnology: Concepts, Methods and Applications. Oxford & IBH.
3. Gupta PK. 1997. Elements of Biotechnology. Rastogi Publ.
4. Singh BD. 2005. Biotechnology, Expanding Horizons. Kalyani.

Reference Books

1. Hackett PB, Fuchs JA & Messing JW. 1988. An Introduction to Recombinant DNA Technology - Basic Experiments in Gene Manipulation. 2nd Ed. Benjamin Publ. Co.

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2. Sambrook J & Russel D. 2001. Molecular Cloning - a Laboratory Manual. 3rd Ed. Cold Spring Harbor Lab. Press.

Semester – II

Course	Course title	Subject Code	Credit
Major Courses	Production technology of warm season vegetablecrops	MHVS20S504	3(2+1)
	Breeding of vegetable crops	MHVS20S505	3(2+1)
	Fundamentals of processing of vegetable	MHVS20S506	2(1+1)
	Growth and Development of Vegetable Crops	MHVS20S507	3(2+1)
Minor Courses	Hormonal regulation of plant growth and development	MPPH20S503	3(2+1)
Supporting Courses	Statistics – II Experimental Design	MSTA20S512	3(2+1)
Compulsory Non-Credit Courses	Agricultural Research, Research Ethics and Rural Development	MPGS20S503	1(1+0)
	Disaster Management	MPGS20S504	1(1+0)
	Technical Writing and Communication Skills	MPGS20S505	1(0+1)

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Class			M.Sc. (Agriculture)	
Year/Semester			1 st Year, 2 nd Semester	
Department			Horticulture (Vegetable Science)	
Paper Name			Topic seminar	
Subject Code			MATS20S501	
L	T	P	Credit Total	1(0+1)
0	0	1		

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Class			M.Sc. (Agriculture)	
Year/Semester			1 st Year, 2 nd Semester	
Department			Horticulture (Vegetable Science)	
Paper Name			Production technology of warm season Vegetable crops	
Subject Code			MHVS20S504	
L	T	P	Credit Total	3(2+1)
2	0	1		
<p>Course Objectives: The course is aimed at</p> <ol style="list-style-type: none"> 1. Demonstrating the fundamental production technology of vegetables 2. Imparting knowledge on management technology of vegetables 3. Imparting practical experience on production technology of vegetables <p>Expected Course Outcomes: At the end of the course the student should be able to</p> <ol style="list-style-type: none"> 1. Appreciate the importance of cultivating vegetables 2. Demonstrate ideas on cultivating vegetables 3. Understand the physiological disorders undermining the yield of vegetables 4. Plan for commercial cultivation of vegetables 5. Cultivate and demonstrate marketing of vegetables 				
Unit	Syllabus			Periods
UNIT 1	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 Tomato, eggplant, hot and sweet peppers.			7
UNIT 2	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 Okra, beans, cowpea and clusterbean.			7
UNIT 3	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 Cucurbitaceous crops.			6
UNIT 4	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			5

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SCHOOL OF AGRICULTURE

	crop production and seed production of Tapioca and sweet potato.	
UNIT 5	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 Green leafy warm season vegetables.	5

Practical (30 Periods)

Cultural operations (fertilizer application, sowing, mulching, irrigation, weed control) of summer vegetable crops and their economics. Study of physiological disorders and deficiency of mineral elements, preparation of cropping schemes for commercial farms. Experiments to demonstrate the role of mineral elements, physiological disorders. Plant growth substances and herbicides; seed extraction techniques. Identification of important pests and diseases and their control. Maturity standards; economics of warm season vegetable crops.

Text Books

1. Chadha KL & Kalloo G. (Eds.). 1993-94. Advances in Horticulture. Vols. V-X. Malhotra Publ. House.
2. Chadha KL. (Ed.). 2002. Hand Book of Horticulture. ICAR.
3. Chauhan DVS. (Ed.). 1986. Vegetable Production in India. Ram Prasad & Sons. Decoteau DR. 2000. Vegetable Crops. Prentice Hall.

Reference Books

1. Bose TK & Som MG. (Eds.). 1986. Vegetable Crops in India. Naya Prakash.
2. Bose TK, Kabir J, Maity TK, Parthasarathy VA & Som MG. 2003. Vegetable Crops. Vols. I-III. Naya Udyog.
3. Bose TK, Som MG & Kabir J. (Eds.). 2002. Vegetable Crops. Naya Prokash. Brown HD & Hutchison CS. Vegetable Science. JB Lippincott Co.
4. Edmond JB, Musser AM & Andrews FS. 1964. Fundamentals of Horticulture. Blakiston
5. Fageria MS, Choudhary BR & Dhaka RS. 2000. Vegetable Crops Production Technology. Vol. II. Kalyani.
6. Salunkhe DK & Kadam SS. (Ed.). 1998. Hand Book of Vegetable Science and Technology Production, Composition, Storage and Processing.

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Class			M.Sc. (Agriculture)	
Year/Semester			1 st Year, 2 nd Semester	
Department			Horticulture (Vegetable Science)	
Paper Name			Breeding of vegetable crops	
Subject Code			MHVS20S505	
L	T	P	Credit Total	3(2+1)
2	0	1		

Course Objectives: The course is aimed at

1. Describing the importance of plant breeding
2. Imparting knowledge on means of exploiting plants through breeding.
3. Introducing the role of biotechnology and IPR in crop improvement.

Expected Course Outcome: At the end of the course the student should be able to

1. Understand how humans have flourished due to breeding and domestication of plants
2. Correlate the genetics behind breeding of crops
3. Comprehend breeding of crops
4. Exploit crops to express hybrid vigour
5. Realize the necessity of protecting farmers and breeders rights
6. Practice hybridization and plan breeding experiments

Unit	Syllabus	Periods
UNIT 1	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. Potato and tomato	7
UNIT 2	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. Eggplant, hot pepper, sweet pepper and okra	6
UNIT 3	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. Peas and beans, amaranth, chenopods and lettuce	7
UNIT 4	Origin, botany, taxonomy, cytogenetics, genetics, breeding objectives, breeding methods (introduction, selection, hybridization, mutation), varieties and varietal characterization,	5

	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. Gourds, melons, pumpkins and squashes	
UNIT 5	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. Cabbage, cauliflower, carrot, beetroot, radish, sweet potato and tapioca	5

Practical (30 Periods)

Selection of desirable plants from breeding population observations and analysis of various qualitative and quantitative traits in germplasm, hybrids and segregating generations. Induction of flowering, palanological studies, selfing and crossing techniques in vegetable crops. Hybrid seed production of vegetable crops in bulk. Screening techniques for insect-pests, disease and environmental stress resistance in above mentioned crops, demonstration of sib-mating and mixed population. Molecular marker techniques to identify useful traits in the vegetable crops and special breeding techniques. Visit to breeding blocks.

Text Books

1. Dhillon BS, Tyagi RK, Saxena S. & Randhawa GJ. 2005. Plant Genetic Resources Horticultural Crops. Narosa Publ. House.
2. Fageria MS, Arya PS & Choudhary AK. 2000. Vegetable Crops Breeding and Seed Production. Vol. I. Kalyani.
3. Kalloo G. 1988. Vegetable Breeding. Vols. I-III. CRC Press.

Reference Books

1. Allard RW. 1999. Principles of Plant Breeding. John Wiley & Sons. Basset MJ. (Ed.). 1986. Breeding Vegetable Crops. AVI Publ.
2. Gardner EJ. 1975. Principles of Genetics. John Wiley & Sons.
3. Hayes HK, Immer FR & Smith DC. 1955. Methods of Plant Breeding. McGraw-Hill.
4. Hayward MD, Bosemark NO & Romagosa I. (Eds.). 1993. Plant Breeding- Principles and Prospects. Chapman & Hall.

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Class			M.Sc. (Agriculture)	
Year/Semester			1 st Year, 2 nd Semester	
Department			Horticulture (Vegetable Science)	
Paper Name			Fundamentals of processing of vegetables	
Subject Code			MHVS20S506	
L	T	P	Credit Total	2(1+1)
1	0	1		
<p>Course Objectives: The course is aimed at</p> <ol style="list-style-type: none"> 1. Describing the role of post-harvest technology in extending shelf life of agricultural produces 2. Improving the knowledge and need on value addition in agro-processing 3. Developing hands on training on processing of different vegetable products <p>Expected Course Outcome: At the end of the course the student should be able to</p> <ol style="list-style-type: none"> 1. Discuss on the importance of post-harvest management of crops 2. Analyze effective methods of storage of the harvested produce 3. Define processing and value addition of harvested crop produces 4. Formulate and describe packaging of value added products from vegetables 5. Develop entrepreneur skills and discover ideas to process vegetables 				
Unit	Syllabus			Periods
UNIT 1	History of food preservation. Present status and future prospects of vegetable preservation industry in India.			2
UNIT 2	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 food preservation.			5
UNIT 3	Raw materials for processing. Primary and minimal processing; processing equipments; Layout and establishment of processing industry, FPO licence. Importance of hygiene; Plant sanitation.			3
UNIT 4	Quality assurance and quality control, TQM, GMP. Food standards-FPO, PFA, etc. Food laws and regulations. Food safety-Hazard analysis and critical control points (HACCP). Labeling and labeling act, nutrition labeling.			3
UNIT 5	Major value added products from vegetables. Utilization of by products of vegetable processing industry; Management of waste from processing factory. Investment analysis. Principles and methods of sensory evaluation of fresh and processed vegetables.			2

Practical (30 Periods)

Study of machinery and equipments used in processing of horticultural produce. Chemical analysis for nutritive value of fresh and processed vegetables. Study of different types of spoilages in fresh as well as processed horticultural produce. Classification and identification of spoilage organisms; Study of biochemical changes and enzymes associated with spoilage. Laboratory examination of

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vegetable products; Sensory evaluation of fresh and processed vegetables. Study of food standards – National, international, CODEX Alimentarius; Visit to processing units to study the layout, equipments, hygiene, sanitation and residual / waste management.

Text Books

1. Chadha DS. 2006. The Prevention of Food Adulteration Act. Confed. of Indian Industry.
2. Desrosier NW. 1977. Elements and Technology. AVI Publ. Co. FAO. 1997. Fruit and Vegetable Processing. FAO.

Reference Books

1. Arthey D & Dennis C. 1996. Vegetable Processing. Blackie/Springer- Verlag.
2. FAO. CODEX Alimentarius Joint FAO/WHO Food Standards Programme. 2nd Ed. Vol. VB. Tropical Fresh Fruits and Vegetables. FAO.

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SCHOOL OF AGRICULTURE

Class			M.Sc. (Agriculture)	
Year/Semester			1 st Year, 2 nd Semester	
Department			Horticulture (Vegetable Science)	
Paper Name			Hormonal regulation of plant growth and development	
Subject Code			MPPH20S503	
L	T	P	Credit Total	3(2+1)
2	0	1		
<p>Course Objectives: The course is aimed at</p> <ol style="list-style-type: none"> 1. To apprise the students about structure function of plant growth regulator on growth and development of plant. 2. Quantification of Hormones 3. Extraction of hormones from plant tissue. 4. Bioassays and estimation using physico chemical techniques. <p>Expected Course Outcome: At the end of the course the student should be able to</p> <ol style="list-style-type: none"> 1. Define different physiological process at plant and cellular level 2. Summarize mechanisms of uptake, transport and translocation of hormones 3. Relate the importance of growth regulators in plant growth 4. Explain nutrient deficiencies and physiological requirements of plants 				
Unit	Syllabus			Periods
UNIT 1	Definition and classification of plant growth regulators- Hormones, endogenous growth substances and synthetic chemicals, endogenous growth regulating substances other than hormones. triconanol, Phenols – polyamines, jasmonates, Concept of death hormone.			5
UNIT 2	Site of synthesis, biosynthetic pathways and metabolism and the influence on plant growth development of individual group of hormones- Auxins, Gibberlins, Cytokinins, Absciscic acid, Ethylene, Brassinosteroids.			5
UNIT 3	Hormone mutants and transgenic plants in understanding role of hormones. Signal perception, transduction, and effect at functional gene level of different hormones- Auxins- cell elongation, Gibberellins -, germination of dormant seeds, Cytokinins- cell division. Retardation of senescence of plant parts, Absciscic acid-Stomatal closure and induction of drought resistance Ethylene- fruit ripening.			8
UNIT 4	Interaction of hormones in regulation of plant growth and development processes.			4
UNIT 5	Rooting of cuttings-Flowering. Apical dominance, molecular aspects of control of reproductive growth and development. Synthetic growth regulators- Classification, their effect on plant growth and development. Practical utility in agriculture and horticulture.			8

Practical (30 Periods)

Quantification of Hormones- Principles of bioassays, physico chemical techniques and immunoassay, Extraction of hormones from plant tissue. Auxins- bioassays- auxins effect

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onrooting of cuttings, abscission, apical dominance, Gibberellins- bioassays-GA effect on germination of dormant seeds, Cytokinin- bioassays- estimation using immunoassay technique cytokinin effect on apical dominance and senescence ABA bioassay estimation using immunoassay technique. ABA effect on somatal movement.
Ethylene bioassays, estimation using physico chemical techniques- effect on breaking dormancy in sunflower and groundnut.

Text Books

1. Taiz L & Zeiger E. 2006. Plant Physiology. 4th Ed. Sinauer Associates. ers JB. (Eds.). 2007. Functional-Structural Plant Modelling in Crop Production. Vol. XXII. Springer.
2. Edwin Oxlade & Graham Lawler. Plant Physiology: The Structure of Plants Explained. John Wiley & Sons.

Reference Books

1. Hopkins WG & Huner NPA. 2004. *Introduction to Plant Physiology*. John Wiley & Sons.
2. Salisbury FB & Ross C. 1992. *Plant Physiology*. 4th Ed. Wadsworth Publ.

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Class			M.Sc. (Agriculture)		
Year/Semester			1 st Year, 2 nd Semester		
Department			Horticulture (Vegetable Science)		
Paper Name			Experimental designs		
Subject Code			MSTA20S512		
L	T	P	Credit Total	3(2+1)	
2	0	1			
<p>Course Objectives: The course is aimed at</p> <ol style="list-style-type: none"> 1. Explaining the role of statistics in agriculture 2. Imparting knowledge on collection, analysis and presentation of data 3. Interpreting simple agricultural experiments <p>Expected Course Outcome: After completing the course, the student should be able to</p> <ol style="list-style-type: none"> 1. Present and analyze scientific data 2. Solve problems on probability 3. Interpret statistical test outcomes 4. Design and analyze experiments 5. Appreciate the applications of statistical methods in science and engineering 6. Apply relevant statistical analysis to experimental data 					
Unit		Syllabus			Periods
UNIT 1		Need for designing of experiments, characteristics of a good design. Basic principles of designs- randomization, replication and local control.			5
UNIT 2		Uniformity trials, size and shape of plots and blocks; Analysis of variance; Completely randomized design, randomized block design and Latin square design.			5
UNIT 3		Factorial experiments, (symmetrical as well as asymmetrical). orthogonality and partitioning of degrees of freedom, Confounding in symmetrical factorial experiments, Factorial experiments with control treatment.			7
UNIT 4		Split plot and strip plot designs; Analysis of covariance and missing plot techniques in randomized block and Latin square designs; Transformations, crossover designs, balanced incomplete block design, resolvable designs and their applications ~ Lattice design, alpha design-concepts, randomisation procedure, analysis and interpretation of results. Response surfaces. Experiments with mixtures.			10
UNIT 5		Bioassays- direct and indirect, indirect assays based on quantal dose response, parallel line and slope ratio assays potency estimation.			3

Practical (15 Periods)

Uniformity trial data analysis, formation of plots and blocks, Fairfield Smith Law; Analysis of data obtained from CRD, RBD, LSD. Analysis of factorial experiments without and with confounding. Analysis with missing data; Split plot and strip plot designs; Transformation of data. Analysis of resolvable designs. Fitting of response surfaces.

M. K. S.

D. K. S.

P. S. S.

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Class			M.Sc. (Agriculture)		
Year/Semester			1 st Year, 2 nd Semester		
Department			Horticulture (Vegetable Science)		
Paper Name			Agricultural research, research ethics and rural development programmes		
Subject Code			MPGS20S503		
L	T	P	Credit Total	1(1+0)	
1	0	0			
<p>Course Objectives: The course is aimed at</p> <ol style="list-style-type: none"> 1. To enlighten the students about the organization and functioning of agricultural research systems at national and international levels 2. To learn research ethics related to agriculture. 3. To give knowledge about rural development programmes and policies of Government. <p>Expected Course Outcome: After completing the course, the student should be able to</p> <ol style="list-style-type: none"> 1. Develop skills to govern all the agricultural research programmes. 2. Knowledge about research ethics, research integrity, research safety in laboratories, welfare of animals used in research. 					
Unit	Syllabus				Periods
UNIT 1	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.				8
UNIT 2	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 scientific mobility.				10
UNIT 3	Research ethics: research integrity, research safety in laboratories, welfare of animals used in research, computer ethics, standards and problems in research ethics.				5
UNIT 4	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,				3
UNIT 5	Integrated Rural Development Programme (IRDP)				4

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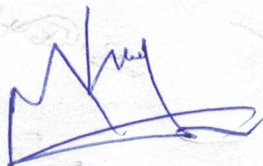
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Text Books

1. Bhatta GS & Singh G. 2001. Indian Agriculture - Four Decades of Development. Sage Publ.
2. Punia MS. Manual on International Research and Research Ethics. CCS, Haryana Agricultural University, Hisar.

References Books

1. Rao BSV. 2007. Rural Development Strategies and Role of Institutions - Issues, Innovations and Initiatives. Mittal Publ.
2. Singh K..1998. Rural Development- Principles, Policies and Management. Sage Publ.

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Class			M.Sc. (Agriculture)	
Year/Semester			1 st Year, 2 nd Semester	
Department			Horticulture (Vegetable Science)	
Paper Name			Disaster management	
Subject Code			MPGS20S504	
L	T	P	Credit Total	1(1+0)
1	0	0		
<p>Course Objectives: The course is aimed at</p> <ol style="list-style-type: none"> 1. To introduce learners to the key concepts and practices of natural disaster management. 2. To equip them to conduct thorough assessment of hazards, and risks vulnerability; and capacity building. <p>Expected Course Outcome: After completing the course, the student should be able to</p> <ol style="list-style-type: none"> 1. Previously predict natural disasters when these come. 2. Management of natural disasters through different scientific approaches 				
Unit	Syllabus			Periods
UNIT 1	Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, Drought, Cyclone, Earthquakes, Landslides, Avalanches,			3
UNIT 2	Volcanic eruptions, Heat and cold Waves, Climatic Change: Global warming, Sea Level rise, Ozone Depletion			2
UNIT 3	Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire. Oil fire, air pollution, water pollution, deforestation, Industrial wastewater pollution, road accidents, rail accidents, air accidents, sea accidents.			5
UNIT 4	Disaster Management- Efforts to mitigate natural disasters at national and global levels. International Strategy for Disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs,			3
UNIT 5	Community-based organizations, and media. Central, State, District and local Administration; Armed forces in Disaster response; Disaster response: Police and other organizations.			2

Text Books

1. Gupta HK. 2003. Disaster Management. Indian National Science Academy. Orient Blackswan.
2. Sharma VK. 2001. Disaster Management. National Centre for Disaster Management, India.

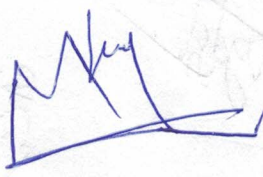
Reference Books

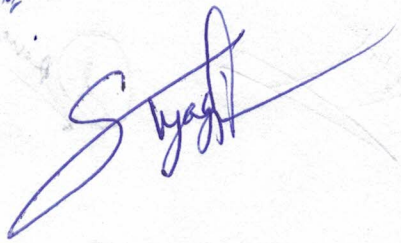
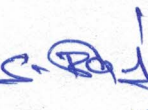
1. Hodgkinson PE & Stewart M. 1991. Coping with Catastrophe: A Handbook of Disaster Management. Routledge.

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Semester – III

Course Type	Course Title	Subject Code	Credits
Non – Credit Course	Comprehensive – Major	MACM20S501	-
	Comprehensive – Minor	MACN20S502	-
	Master's Research	MARE20S501	-
Practical	Master Seminar	MASE20S501	1(0+1)




Class			M.Sc. (Agriculture)
Year/Semester			2 nd Year, III rd Semester
Department			Horticulture (Vegetable Science)
Paper Name			Technical Writing and Communications Skills
Subject Code			MPGS20S505
L	T	P	Credit Total
0	0	1	
			1(0+1)
<p>Course Objectives: The course is aimed at</p> <ol style="list-style-type: none"> 1. Enhancing communication skills in English. 2. Developing writing skills and improving vocabulary. 3. Imparting knowledge on developing presentation skills. <p>Expected Course Outcome: At the end of the course the student should be able to</p> <ol style="list-style-type: none"> 1. Analyze grammatical errors. 2. Identify correct pronunciation. 3. Express writing skills. 4. Comprehend the course materials of all courses and improve oral communication skills. 5. Demonstrate presentation skills. 6. Illustrate communication skills. 			

Practical (30 periods)

Technical Writing - Various forms of scientific writings- theses, technical papers, reviews, manuals, etc; Various parts of thesis and research communications (title page, authorship contents page, preface, introduction, review of literature, material and methods, experimental results and discussion); Writing of abstracts, summaries, précis, citations etc.; commonly used abbreviations in the theses and research communications; illustrations, photographs and drawings with suitable captions; pagination, numbering of tables and illustrations; Writing of numbers and dates in scientific write-ups; Editing and proof-reading; Writing of a review article.

Communication Skills - Grammar (Tenses, parts of speech, clauses, punctuation marks); Error analysis (Common errors); Concord; Collocation; Phonetic symbols and transcription; Accentual pattern: Weak forms in connected speech: Participation in group discussion: Facing an interview; presentation of scientific papers.

Text Books

1. Chicago Manual of Style. 14th Ed. 1996. Prentice Hall of India.
2. Mohan K. 2005. Speaking English Effectively. MacMillan India. Richard WS. 1969. Technical Writing. Barnes & Noble.

Reference Books

1. Gordon HM & Walter JA. 1970. Technical Writing. 3 Ed. Holt,
2. Rinehart & Winston. Hornby AS. 2000. Comp. Oxford Advanced Learner's Dictionary of Current English. 6 Ed. Oxford University Press.

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Class			M.Sc. (Agriculture)	
Year/Semester			2 nd Year, III rd Semester	
Department			Horticulture (Vegetable Science)	
Paper Name			Intellectual Property and its Management in Agriculture	
Subject Code			MPGS20S506	
L	T	P	Credit Total	1(1+0)
1	0	0		
<p>Course Objectives: The course is aimed at</p> <ol style="list-style-type: none"> 1. To introduce the classical concepts of soil chemistry. 2. To familiarize students with modern developments in chemistry of soils in relation to using soils as a medium for plant growth. 3. To know nutrient uptake by plants from soil. <p>Expected Course Outcome: At the end of the course the student should be able to</p> <ol style="list-style-type: none"> 1. Analysis of soil samples collected from different areas. 2. Develop skills to find out suitable soil for growing different field crops. 3. Analytical techniques and instrumental methods in soil and plant analysis. 				
Unit	Syllabus			Periods
UNIT 1	Historical perspectives and need for the introduction of Intellectual Property Right regime; TRIPs and various provisions in TRIPS Agreement.			3
UNIT 2	Intellectual Property and Intellectual Property Rights (IPR), benefits of securing IPRs; Indian Legislations for the protection of various types of Intellectual Properties.			3
UNIT 3	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.			3
UNIT 4	Protectable subject matters, protection in biotechnology, protection of other biological materials, ownership and period of protection; National Biodiversity protection initiatives; Convention on Biological Diversity.			3
UNIT 5	International Treaty on Plant Genetic Resources for Food and Agriculture; Licensing of technologies, Material transfer agreements, Research collaboration Agreement, License Agreement.			3

Text Books

1. Ministry of Agriculture, Government of India. 2004. State of Indian Farmer. Vol. V. Technology Generation and IPR Issues. Academic Foundation.

Reference Books

1. Erbisch FH & Maredia K.1998. Intellectual Property Rights in Agricultural Biotechnology. CABI.
2. Ganguli P. 2001. Intellectual Property Rights: Unleashing Knowledge Economy. McGraw-Hill. Intellectual Property Rights: Key to New Wealth Generation. 2001. NRDC & Aesthetic Technologies.

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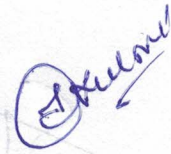

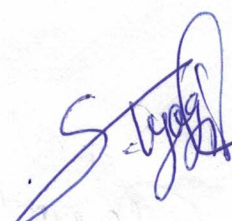
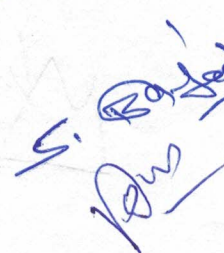
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SCHOOL OF AGRICULTURE

Class			M.Sc. (Agriculture)	
Year/Semester			2 nd Year, III rd Semester	
Department			Horticulture (Vegetable Science)	
Paper Name			Master's Research	
Subject Code			MARE20S501	
L	T	P	Credit Total	10(0+10)
0	0	10		

UNIT	UNIT CONTENTS	UNIT
UNIT 1	Introduction to Horticulture and its importance in the production of food and nutrition.	UNIT 1
UNIT 2	Historical background and evolution of Horticulture in India and abroad.	UNIT 2
UNIT 3	Production of various types of vegetables and fruits.	UNIT 3
UNIT 4	Production of various types of vegetables and fruits.	UNIT 4
UNIT 5	Production of various types of vegetables and fruits.	UNIT 5
UNIT 6	Production of various types of vegetables and fruits.	UNIT 6
UNIT 7	Production of various types of vegetables and fruits.	UNIT 7
UNIT 8	Production of various types of vegetables and fruits.	UNIT 8
UNIT 9	Production of various types of vegetables and fruits.	UNIT 9
UNIT 10	Production of various types of vegetables and fruits.	UNIT 10

Semester – IV

Course Title	Subject Code	Credits
Master's Research	MARE20S501	-

Class	M.Sc. (Agriculture)		
Year/Semester	2 nd Year, IV th Semester		
Department	Horticulture (Vegetable Science)		
Paper Name	Master's Research		
Subject Code	MARE20S501		
L	T	P	Credit Total
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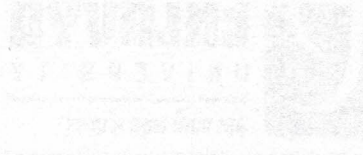
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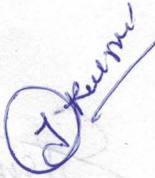

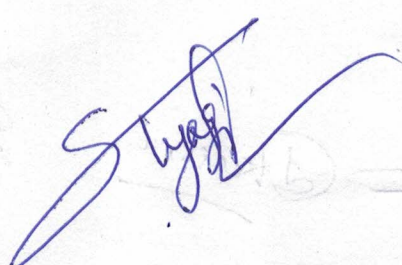
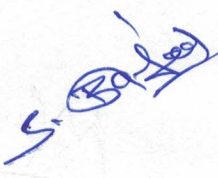
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Semester - IV

Sl. No.	Subject Code	Credits
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