Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Agriculture
Ph.D. (Hort.) in Vegetable Science

Course Title with Credit Load

Course Code	Course Title	Credit Hours
	Major Courses (12 Credits)	
VSC 601	Recent Trends in Vegetable Production	3+0
VSC 602	Advances in Breeding of Vegetable Crops	3+0
VSC 603	Abiotic Stress Management in Vegetable Crops	2+1
VSC 604	Seed Certification, Processing and Storage of Vegetable Crops	2+1
VSC 605	Breeding of Special Traits in Vegetable Crops	2+0
VSC 606	Biodiversity and Conservation of Vegetable Crops	2+1
VSC 607	Biotechnological Approaches in Vegetable Crops	2+1
VSC 608	Advanced Laboratory Techniques for Vegetable Crops	1+2
	Minor Courses	06
	Supporting Courses	05
VSC 691	Seminar I	0+1
VSC 692	Seminar II	0+1
VSC 699	Research	0+75
	Total Credits	100

Agron 603: Irrigation Management (2+1)

Course code	Course Name	TEACHING & EVALUATION SCHEME							
		THEORY			PRACTICAL		L	P	CREDITS
		End Sem University Exam	Mid Term Exam	Teachers Assessment*	End Sem University Exam	Teachers Assessment*			
Agron 603	Irrigation Management	60	0	20	15	05	2	1	3

Aim of the course: To teach students about optimization of irrigation in different crops under variable agro climatic conditions.

Theory

Unit I: Global water resources; Water resources of India, irrigation projects during pre and post independence period and their significance in crop production; irrigation needs, atmospheric, soil, agronomic, plant and water factors affecting irrigation need; water deficits and crop growth.

Unit II: Movement of water in soil-water movement under saturated and unsaturated conditions, Poiseulle's and Darcy's law, general equation of saturated and unsaturated flow of water in soil. Soil-plant-water relationships, evaporation, transpiration and evapo-transpiration, significance of transpiration, energy utilization in transpiration, physiological processes and crop productivity.

Unit III: Water requirement, irrigation needs, factors affecting irrigation need; water use efficiency, Infiltration; water movement under saturated and unsaturated conditions; management practices for improving water use efficiency of crops, crop water stress – water deficits and crop growth, adoptability to the crops. Water availability with relation to nutrient availability, economic analysis of irrigation and cop planning for optimum use of irrigation water, crop water production function

Unit IV: Soil and plant water potential, SPAC, transpiration and evapo-transpiration, significance of transpiration, energy utilization in transpiration, factors affecting ET, control of ET by mulching and use of anti transpirents; fertilizer use in relation to irrigation, Strategies of using limited water supply; factors affecting ET, control of ET by mulching and use of anti transpirants; fertilizer use in relation to irrigation; optimizing the use of given irrigation supplies.

Unit V: Application of irrigation water, conveyance and distribution system, irrigation efficiency; agronomic considerations in the design and operation of irrigation projects; characteristics of irrigation and farming systems affecting irrigation management, land suitability for irrigation, land irrigability classification; integrated water management in command areas,

institution of water management in commands, farmer's participation in command areas; irrigation legislation.

Practical

- Determination of water infiltration characteristics and water holding capacity of soil profiles.
- Determination Moisture extraction pattern of crops
- Determination of water balance component of transplanted rice by drum culture technique
- Determination of consumptive use and water requirement of a given cropping pattern
- Determination of crop efficient of one important crop
- Planning, designing and installation of drip irrigation system
- Planning, designing and installation of sprinkler irrigation system
- Designing of drainage channel
- Measurement of irrigation efficiencies
- Determination of irrigation timing under different methods of irrigation
- Visit to irrigation command area

Teaching methods/activities
Classroom teaching with AV aids, group discussion, oral presentation by students.

Learning outcome
Management of irrigation water for sustainable agriculture

Suggested Reading

- MP. Singh 2017. Recent advances in Irrigation water management. Kalyani Publishers
- FAO. 1984. Irrigation Practice and Water Management. Oxford & IBH.
- Michael AM. 1978. Irrigation: Theory and Practice. Vikas Publ.
- Mishra RR and Ahmad M. 1987. Manual on Irrigation and Agronomy. Oxford & IBH.
- Panda SC. 2003. Principles and Practices of Water Management. Agrobios.
- Reddy SR. 2000. Principles of Crop Production. Kalyani.
- Sankara Reddy GH and Yellamananda Reddy. 1995. Efficient Use of Irrigation Water. In: Gupta US. (Ed.). Production and Improvement of Crops for Drylands. Oxford & IBH.
- Singh SS. 2006. Principles and Practices of Agronomy. In: Gupta US.(Ed.). Production and Improvement of Crops for Drylands. Oxford & IBH

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AGRON 604: RECENT TRENDS IN WEED MANAGEMENT (2+0)

Course code	Course Name	TEACHING & EVALUATION SCHEME							
		THEORY			THEORY		L	P	CREDITS
		End Sem University Exam	Mid Term Exam	Teachers Assessment*	End Sem University Exam	Teacher's Assessment*			
AGRON 604	Recent Trends in Weed Management	60	00	40	00	00	2	0	2

Legends: L - Lecture; P – Practical;

*Teacher Assessment shall be based on following components: Quiz / Assignment / Project / Participation in Class etc.

Objective

To teach about the changing weed flora, new herbicides, their resistance, toxicity, antidotes and residue management under different cropping systems

Theory

UNIT I

Crop-weed competition in different cropping situations; changes in weed flora, various causes and effects; different methods of weed management. Migration, introduction, adaptation of weeds, Invasive weeds – biology and management. Different mechanisms of invasion – present status and factors influencing weed invasion.

Unit II

Physiological and biological aspects of herbicides, their absorption, translocation, metabolism and mode of action; selectivity of herbicides and factors affecting them. Climatic factors and phytotoxicity of herbicides; fate of herbicides in soil and factors affecting them, Degradation of herbicides in soil and plants- factors affecting it, primary and secondary metabolites, residue management of herbicides, adjuvants.

Unit III

Advances in herbicide products and application techniques and methods; herbicide resistance; antidotes and crop protection compatibility of herbicides of different groups; compatibility of herbicides with other pesticides; herbicide rotation and herbicide mixtures.

UNIT IV

Development of transgenic herbicide resistant crops; herbicide development, registration procedures.

UNIT V

Relationship of herbicides with tillage, fertilizer, and irrigation, cropping system; bioherbicides, allelochemical and alleloherbicides, herbicide bioassays. Recent advances in nonchemical weed management including deleterious rhizobacteria, robotics, biodegradable film, etc.

Suggested Readings

• Böger, Peter, Wakabayashi, Ko, Hirai, Kenji (Eds.). 2002. Herbicide Classes in Development. Mode of Action, Targets, Genetic Engineering, Chemistry. Springer.

• Das TK. 2008. Weed Science: Basics and Applications, Jain Brothers (New Delhi)

• Fennimore, Steven A and Bell, Carl. 2014. Principles of Weed Control, 4th Ed, California Weed Sci. Soc.

• Gupta OP. 2007. Weed Management: Principles and Practices, 2nd Ed.

• Jugulan M, (ed). 2017. Biology, Physiology and Molecular Biology of Weeds. CRC Press

• Monaco TJ, Weller SC and Ashton FM. 2014. Weed Science Principles and Practices, Wiley

• Powles SB and Shaner DL. 2001. Herbicide Resistance and World Grains, CRC Press.

• Walia US. 2006. Weed Management, Kalyani.

• Zimdahl RL. (ed). 2018. Integrated Weed Management for Sustainable Agriculture, B. D. Sci. Publ.

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PSM 601: Advances in Production of Plantation and Spice Crops (3+0)

Course code	Course Name	TEACHING & EVALUATION SCHEME							
		THEORY			THEORY		L	P	CREDITS
		End Sem University Exam	Mid Term Exam	Teachers Assessment*	End Sem University Exam	Teacher's Assessment*			
PSM 601	Advances in Production of Plantation and Spice Crops	60	00	40	00	00	3	0	3

Legends: L - Lecture; P – Practical;

*Teacher Assessment shall be based on following components: Quiz / Assignment / Project / Participation in Class etc.

Objective

The course is designed to provide advanced crop production techniques of various plantation and spice crops grown in India.

Theory

Unit I: Area, production, productivity: Indian and world scenario: Role of plantation and spice crops in national economy, area-production statistics at national and international level, productivity challenges, industrial requirement of plantation and spice crops, demand-supply scenario of plantation and spice crop.

Unit II: Export potential: Export scenario, market opportunities and challenges in plantation and spice crops, global imports and exports, export of organic produce and products. Promotional programmes: Role of commodity boards and directorates. in the development programmes of plantation and spice crops, contract farming, Farmer Producer Organizations (FPO) and Farmer Producer Companies (FPC).

Unit III: Varietal wealth and planting material production: Cultivars and improved varieties in plantation and spice crops, mass multiplication techniques, hi-tech nursery techniques. Agrotechniques: Precision farming techniques, HDP systems, fertigation, chemical regulation of crop productivity, protected cultivation of high value crops, mechanization in plantation and spice crops, hydroponics, aeroponics, application of nanotechnology, robotics.

Unit IV: Impact of climate change: Impact of biotic and abiotic factors on growth and productivity, climate resilient technologies in plantation and spice crops, soil health management, organic production systems. Maturity indices and harvest: Influence of pre and post harvest factors on quality of plantation and spice crops, pre and post harvest management techniques for improving quality, good manufacturing practices in plantation and spice sector.

Unit V: Quality standards: Domestic and international standards, HACCP, BIS standards, domestic and export grades, modern packaging techniques, export protocols.

Crops

Coconut, Arecanut, Oil palm, Cashew, Coffee, Tea, Cocoa, Rubber, Palmyrah, Black pepper, Cardamom, Ginger, Turmeric, Nutmeg, Cinnamon, Clove, Vanilla, Garcinia, Coriander, Cumin, Fennel, Fenugreek, Ajwain, Dill, Safron

Suggested Reading

Afoakwa EO. 2016. *Cocoa Production and Processing Technology*. CRC Press

Agarwal S, Divkarasastry EV and Sharma RK. 2001. *Seed Spices, Production, Quality and Export*. Pointer Publ.

Anonymous. 1985. *Rubber and its Cultivation*. The Rubber Board of India.

Barche S. 2016. *Production Technology o Spices, Aromatic, Medicinal and Plantation Crops*. New India Publishing Agency, New Delhi.

Chadha KL. 2001. *Hand Book of Horticulture*. ICAR.

Chopra VL and Peter KV. 2005. *Handbook of Industrial Crops*. Panima.

Choudappa P, Anitha K, Rajesh MK and Ramesh SV. 2017. *Biotechnology of Plantation Crops*. Daya Publishing House, New Delhi.

Choudappa P, Niral V, Jerard BA and Samsudeen K. 2017. *Coconut*. Daya Publishing House, New Delhi. *E-manual on Advances in Cashew Production Technology*. ICAR-Directorate of Cashew Research, Puttur –574 202, D.K., Karnataka.

Harler CR. 1963. *The Culture and Marketing of Tea*. Oxford Univ. Press.

Joshi P. 2018. *Text Book on Fruit and Plantation Crops*. Narendra Publishing House, New Delhi.

Kurian A and Peter KV. 2007. *Commercial Crops Technology*. New India Publ. Agency.

Marsh AC, Moss MK and Murphy EW. 1977. *Composition of Food Spices and Herbs, Raw, Processed and Prepared*. Agric. Res. Serv. Hand Book 8-2. Washinton DC.

Nair MK, Bhaskararao EVV, Nambiar KKN and Nambiar MC. 1979. *Cashew*. CPCRI, Kasaragod.

Nybe EV, Mini Raj N and Peter KV. 2007. *Spices*. New India Publ. Agency.

Panda H. 2013. *The Complete Book on Cashew*. Asia Pacific Business Press Inc.

Panda H. 2016. *The Complete Book on Cultivation and Manufacture of Tea* (2nd Revised Edition). Asia Pacific Business Press Inc.

Peter KV. 2001. *Hand Book of Herbs and Spices*. Vols. I-III. Woodhead Publ. Co., UK and CRC, USA.

Peter KV. 2002. *Plantation Crops*. National Book Trust.

Pillay PNR. 1980. *Handbook of Natural Rubber Production in India*. Rubber Research Institute, Kottayam. pp.668.

Ponnuswami *et al*. 2018. *Spices*. Narendra Publishing House, New Delhi

Pradeepkumar T, Suma B, Jyothibhaskar and Satheesan KN. 2007. *Management of Horticultural Crops*. Parts I, II. New India Publ. Agency.

Purseglove JW, Brown EG, Green CL and Robbins SRJ. 1984. *Spices*. Vols. I, II. Longman.

Purseglove JW. 1968. *Tropical Crops–Dicotyledons*. Longman.

Ramachandra *et al*. 2018. *Breeding of Spices and Plantation crops*. Narendra Publishing House, New Delhi.

Ranganathan V. 1979. *Hand Book of Tea Cultivation*. UPASI, Tea Res. Stn. Cinchona.

Ravindran PN. 2003. *Cinnamon and cassia*. CRC press.

Ravindran PN. 2004. *Ginger, the genus Zingiber*. CRC press

Ravindran PN. 2007. *Turmeric, the genus curcuma*. CRC press, Medicinal and Aromatic Plants – Industrial Profiles. Routledge, UK.

Ravindran PN. 2001. *Monograph on Black Pepper*. CRC Press.

Ravindran PN. 2017. *The Encyclopedia of Herbs and Spices*. CABI

Ravindran PN and Madhusoodanan KJ. 2002. *Cardamom, the Genus Elettaria*. CRC press.

Sera T, Soccol CR, Pandey A and Roussos S Coffee Biotechnology and Quality. Springer, Dordrecht.

Sethuraj MR and Mathew NT. 1992. *Natural Rubber: Biology, Cultivation and Technology* (Developments in Crop Science). Elsevier Science.

Shanmugavelu KG, Kumar N and Peter KV. 2002. *Production Technology of Spices and Plantation Crops*. Agrobios.

Sharangi AB and Acharya SK. 2008. *Quality management of Horticultural crops*. Agrotech Publishing House, Udaipur; ISBN: 81-8321-090-2

Sharangi AB and Datta S. 2015. *Value Addition of Horticultural crops: Recent trends and Future directions*. SPRINGER; ISBN: 978-81-322-2261-3.

Sharangi AB, Datta S and Deb, P. 2018. *Spices: Agrotechniques for quality produce*, April, Academic Press (Tylor and Francis Groups), New Jersey, USA.

Sharangi AB. 2018. *Indian Spices: The legacy, production and processing of India's treasured export*. Springer International publishing. AG, Part of Springer Nature, 2018, Cham, Switzerland.

Srivastava HC, Vatsaya and Menon KKG. 1986. *Plantation Crops–Opportunities and Constraints*. Oxford and IBH.

Swain SC. 2018. *Precision Farming in Horticulture: Approaches and strategies*. Narendra Publishing House, New Delhi.

Thampan PK. 1981. *Hand Book of Coconut Palm*. Oxford and IBH.

Varmudy V. 2001. *Marketing of Spices*. Daya Publ. House.

Winton AL and Winton KB. 1931. *The Structure and Composition of Food*. John Wiley and Sons.

Yagna Narayan Ayer AK. 1960. *Cultivation of Cloves in India*. ICAR.

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Soil 602: Modern Concept in Soil Fertility (2+0)

Course code	Course Name	TEACHING & EVALUATION SCHEME							
		THEORY			THEORY		L	P	CREDITS
		End Sem University Exam	Mid Term Exam	Teachers Assessment*	End Sem University Exam	Teacher's Assessment*			
Soil 602	Modern Concept in Soil Fertility	60	00	40	00	00	2	0	2

Legends: L - Lecture; P – Practical;

*Teacher Assessment shall be based on following components: Quiz / Assignment / Project / Participation in Class etc.

Objective

To provide knowledge of modern concepts of soil fertility and nutrient use in crop production.

Theory

Unit I

Nutrient availability-concept and relationships, modern concepts of nutrients availability; soil colloids and nutrient availability; soil amendments and availability maintenance of nutrients, soil solution and plant growth; nutrient response functions and availability indices. Nutrient movement in soils; nutrient absorption by plants; mechanistic approach to nutrient supply and uptake by plants; models for transformation and movement of major micronutrients in soils.

Unit II

Chemical equilibria (including solid-solution equilbria) involving nutrientions in soils, particularly in submerged soils; Kinetic studies of nutrients in soils. Modern concepts of fertilizer evaluation, nutrient use efficiency and nutrient budgeting.

Unit III

Modernconcepts in fertilizer application; soil fertility evaluation techniques; role of soil tests in fertilizer use recommendations; site-specific nutrient management for precision agriculture.

Unit IV

Monitoring physical, chemical and biological changes in soils; permanent manurial trials and long term fertilizer experiments; soil productivity under long-term intensive cropping; direct, residual and cumulative effect of fertilizer use.

Unit V

Carbon– a nutrient central to soil fertility; carbon cycle in nature, stocks, pools and fluxes; greenhouse effect and climate change; carbon sequestration vis-à-vis sustenance of soil quality and crop productivity.

Suggested Readings

Barber SA. 1995. *Soil Nutrient Bioavailability*. John Wiley & Sons.

• Barker V Allen and Pilbeam David J. 2007. *Handbook of Plant Nutrition*. CRC / Taylor & Francis.

• Brady NC and Weil RR. 2002. *The Nature and Properties of Soils*. 13th Ed. Pearson Educ.

• Cooke GW. 1979. *The Control of Soil Fertility*. Crossby Lockwood & Sons.

• Epstein E. 1987. *Mineral Nutrition of Plants - Principles and Perspectives*. International Potash Institute, Switzerland.

• Kabata- Pendias Alina 2001. *Trace Elements in Soils and Plants*. CRC / Taylor & Francis.

• Kannaiyan S, Kumar K and Govindarajan K. 2004. *Biofertilizers Technolo*gy. Scientific Publ.

• Mortvedt JJ, Shuman LM, Cox FR and Welch RM. (Eds.). 1991. *Micronutrients in Agriculture.* 2nd Ed. Soil Science Society of America, Madison.

• Prasad R and Power JF. 1997. *Soil Fertility Management for Sustainable Agriculture*. CRC Press.

• Stevenson FJ and Cole MA. 1999. *Cycles of Soil: Carbon, Nitrogen, Phosphorus, Sulphur, Micronutrients.* John Wiley & Sons.

• Stevenson FJ. (Ed.). 1982. *Nitrogen in Agricultural Soils*. Soil Science Society of America, Madison.

• Tisdale SL, Nelson WL, Beaton JD and Havlin JL. 1990. *Soil Fertility and Fertilizers.* 5th Ed. Macmillan Publ.

• Wild A. (Ed.). 1988. *Russell's Soil Conditions and Plant Growth*. 11th Ed. Longman.

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VSC 603: ABIOTIC STRESS MANAGEMENT IN VEGETABLE CROPS (2+1)

Course code	Course Name	TEACHING & EVALUATION SCHEME							
		THEORY			PRACTICAL		L	P	CREDITS
		End Sem University Exam	Mid Term Exam	Teachers Assessment*	End Sem University Exam	Teacher's Assessment*			
VSC 603	Abiotic Stress Management in Vegetable Crops	60	00	20	15	05	2	1	3

Legends: L - Lecture; **P** – Practical;

*Teacher Assessment shall be based on following components: Quiz / Assignment / Project / Participation in Class etc.

Objective

To update knowledge on the recent research trends in the field of abiotic stress management in vegetables.

Theory

UNIT I

Environmental stress—its types, soil parameters including pH, classification of vegetable crops based on susceptibility and tolerance to various types of stress.

Unit II

Mechanism and measurements—tolerance to drought, water logging, soil salinity, frost and heat stress in vegetable crops.

Unit III

Soil-plant-water relations—under different stress conditions in vegetable crops production and their management practices.

Unit IV

Techniques of vegetable growing under water deficit, water logging, salinity and sodicity.

Unit V

Use of chemicals—techniques of vegetable growing under high and low temperature conditions, use of chemicals and antitranspirants in alleviation of different stresses

Practical

• Identification of susceptibility and tolerance symptoms to various types of stress in vegetable crops;

• Measurement of tolerance to various stresses in vegetable crops;

• Short term experiments on growing vegetable under water deficit, water logging, salinity and sodicity, high and low temperature conditions;

• Use of chemicals for alleviation of different stresses.

Suggested Readings

- Dhillon BS, Tyagi RK, Saxena S and Randhawa GJ. 2005. Plant genetic resources: horticultural crops. Narosa Publ. House.
- Dwivedi P and Dwivedi RS. 2005. Physiology of abiotic stress in plants. Agrobios.
- Janick JJ. 1986. Horticultural science. 4th Ed. WH Freeman and Co.
- Kaloo G and Singh K. 2001. Emerging scenario in vegetable research and development. Research periodicals and book publ. house.
- Kaloo G. 1994.Vegetable breeding. Vols. I-III. Vedams eBooks.
- Lerner HR. (Eds.). 1999. Plant responses to environmental stresses. Marcel Decker.
- Maloo SR. 2003. Abiotic stresses and crop productivity.Agrotech Publ. Academy.
- Narendra T. et al. 2012. Improving crops resistance to abiotic stress. Wiley and Sons.US.
- Peter KV and Pradeep Kumar T. 2008. Genetics and breeding of vegetables. (Revised Ed.). ICAR.
- Peter KV and Hazra P. (Eds). 2015. Hand book of vegetables volume II.Studium Press LLC, P.O. Box 722200, Houston, Texas 77072, USA, 509p.
- Peter KV and Hazra P. (Eds). 2015. Hand book of vegetables volume III. Studium Press LLC, P.O. Box 722200, Houston, Texas 77072, USA, 634p.
- Ram HH. 2001. Vegetable breeding. Kalyani.
- Rao NK. (Eds.). 2016. Abiotic stress physiology of horticultural crops. Springer publication.

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VSC 604: SEED CERTIFICATION, PROCESSING AND STORAGE OF VEGETABLE SEEDS (2+1)

Course code	Course Name	TEACHING & EVALUATION SCHEME							
		THEORY			PRACTICAL		L	P	CREDITS
		End Sem University Exam	Mid Term Exam	Teachers Assessment*	End Sem University Exam	Teachers Assessment*			
VSC 604	Seed Certification, Processing and Storage of Vegetable Seeds	60	00	20	15	05	2	1	3

Legends: L - Lecture; **P** – Practical;

*Teacher Assessment shall be based on following components: Quiz / Assignment / Project / Participation in Class etc.

Objective

To impart the knowledge on seed certification, processing and storage of vegetable seeds

Theory

Unit I

Seed certification, history, concepts and objectives, seed certification agency, phases of seed certification, Indian Minimum seed Certification standards, Planning and management of seed certification programmes.

Unit II

Principles and procedures of field inspection, seed sampling, testing and granting certification, OECD certification Schemes.

Unit III

Principles of seed processing, Methods of seed drying and cleaning, seed processing plant- Layout and design, seed treatment, seed quality enhancement, packaging and marketing

Unit IV

Principles of Seed Storage, orthodox/ recalcitrant seeds, types of storage (open, bulk, controlled, germplasm, cryopreservation), factors affecting seed longevity in storage (Pre and post harvest factors).

UNIT V

Seed aging and deterioration, maintenance of seed viability and vigor during storage, storage methods, storage structures, transportation and marketing of seeds.

Practical

• General procedures of seed certification;

• Field inspection and standards;

• Isolation and rouging;

• Inspection and sampling at harvesting, threshing and processing;

• Testing physical purity, germination and moisture, grow-out test;

• Visit to regulatory seed testing and plant quarantine laboratories;

• Seed processing plants and commercial seed stores.

Suggested Readings

- Agarwaal PK and Anuradha V. 2018. Fundamentals of seed science and technology. Brilliant publications, New Delhi.
- Basra AS. 2000. Hybrid seed production in vegetables. CRC press, Florida, USA.
- Bench ALR and Sanchez RA. 2004. Handbook of seed physiology. Food products press, NY/ London.
- Chakraborty SK, Prakash S, Sharma SP and Dadlani M. 2002. Testing of distinctiveness, uniformity and stability for plant variety protection. IARI, New Delhi
- Copland LO and McDonald MB. 2004. Seed science and technology, Kluwer academic press.
- Fageria MS, Arya PS and Choudhry AK. 2000. Vegetable crops: breeding and seed production Vol 1. Kalyani publishers, New Delhi.
- George RAT. 1999. Vegetable seed production (2nd Edition). CAB International.
- Hazra P and Som MG. 2016. Vegetable seed production and hybrid technology (Second revised edition), Kalyani publishers, Ludhiana, 459p
- Kalloo G, Jain SK, Vari AK and Srivastava U. 2006. Seed: A global perspective. Associated publishing company, New Delhi.
- Singhal NC. 2003. Hybrid seed production. Kalyani publishers, New Delhi

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PGS 505: AGRICULTURAL RESEARCH, RESEARCH ETHICS AND RURAL DEVELOPMENT PROGRAMMES (1+0)

Course Code	Course Name	TEACHING & EVALUATION SCHEME							
		THEORY			PRACTICAL		L	P	CREDITS
		End Sem University Exam	Mid Term Exam	Teachers Assessment*	End Sem University Exam	Teachers Assessment*			
PGS 505	Agricultural Research, Research Ethics and Rural Development Programmes	60	00	40	0	0	1	0	1

Legends: L - Lecture; **P** – Practical;

*Teacher Assessment shall be based on following components: Quiz / Assignment / Project / Participation in Class etc.

Objective

To enlighten the students about the organization and functioning of agricultural research systems at national and international levels, research ethics, and rural development programmes and policies of Government.

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.

UNIT II

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.

UNIT III

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

UNIT IV

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.

UNIT V

Integrated Rural Development Programme (IRDP), Panchayati Raj Institutions, Co-operatives, Voluntary Agencies/Non-Governmental Organisations. Critical evaluation of rural development policies and programmes. Constraints in implementation of rural policies and programmes.

Suggested Readings

- Bhalla G S & Singh G. 2001. *Indian Agriculture - Four Decades of Development*. Sage Publ.
- Punia M S. *Manual on International Research and Research Ethics*. CCS, Haryana Agricultural University, Hisar.
- Rao B S V. 2007. *Rural Development Strategies and Role of Institutions - Issues, Innovations and Initiatives*. Mittal Publ.
- Singh K. 1998. *Rural Development - Principles, Policies and Management*. Sage Publ.

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