

**Integral University, Lucknow**  
**Integral Institute of Agricultural Science and Technology (IIAST)**  
**Evaluation Scheme of Post Graduate Program**  
**M. Sc. (Ag.) Horticulture**  
**w.e.f. 2019-20**

**Semester-II**

Course Code	Subject	Type of Course	Periods/Per week			Evaluation Scheme Theory Mid Sem			Evaluation Scheme Practical Mid Sem			Practical End Sem Exam	Sub Total (Mid Sem Theory + Practical End Sem Exam)	End Sem Theory Exam	Subject Total	Credit	Total Credit Points
			L	T	P	CT	TA	Total	CT	TA	Total						
APH512	Production Technology of Medicinal and Aromatic Plants	Core courses (Compulsory)	2	0	2	20	10	30	-	-	-	20	50	50	100	2:0:1	3
APH513	Tropical and Subtropical Fruit Production		2	0	2	20	10	30	-	-	-	20	50	50	100	2:0:1	3
<b>Total</b>																	
APH517	Production Technology of Ornamental Plants	Optional Courses	1	0	2	20	10	30	-	-	-	20	50	50	100	1:0:1	2
<b>Total</b>																	*
<b>*Major Course (Core course + Optional course) should not exceed more than 9 credit</b>																	
AG511	Production Technology of Warm Season Vegetable Crops	Minor/ Related/ Supporting courses	2	0	2	20	10	30	-	-	-	20	50	50	100	2:0:1	3
AG512	Breeding of Vegetable Crops		2	0	2	20	10	30	-	-	-	20	50	50	100	2:0:1	3
<b>Total</b>																	**
PGS502	Technical Writing and Communications Skills	Non Credit Course (Compulsory)	0	0	2	0	0	0	-	-	-	25	75	0	100	0:0:1	1 <sup>#</sup>
PGS505 (e-Course)	Agricultural Research, Research Ethics and Rural Development Programmes		1	0	0	20	10	30	-	-	-	0	0	70	100	1:0:0	1 <sup>#</sup>
PGS506 (e-Course)	Disaster Management		1	0	0	20	10	30	-	-	-	0	0	70	100	1:0:0	1 <sup>#</sup>
APH591	M.Sc. (Ag.) Seminar		-	-	-	-	-	-	-	-	-	-	-	-	100	0:0:1	1
APH599	M.Sc. (Ag.) Research		-	-	-	-	-	-	-	-	-	-	-	-	S/US	0:0:2	2 <sup>b</sup>
<b>Grand Total</b>																	<b>***</b>

*Grand Total \*\*\* = \*+\*\*, credit should not exceed more than 18 credit in one semester, <sup>#</sup>Non-Gradial Course, <sup>\$</sup>M.Sc. (Ag.) Research credit to be counted in Final Semester examinations, S/US=Satisfactory/Unsatisfactory*

**M.Sc. (Ag.) Horticulture**  
**SEMESTER-II**  
**Syllabus: Production Technology of Medicinal and Aromatic Plants**  
**Paper Code: APH512**  
**w.e.f. Session 2018-19**

**3(2+1)**

**Unit I**

Herbal industry, WTO scenario, Export and import status, Indian system of medicine, Indigenous Traditional Knowledge, IPR issues, Classification of medicinal crops, Systems of cultivation, Organic production, Role of institutions and NGO's in production, GAP in medicinal crop production.

**Unit II**

Production technology for Senna, Periwinkle, Coleus, Aswagandha, Glory lily, Sarpagandha, *Dioscorea* sp., *Aloe vera*, *Phyllanthus amarus*, *Andrographis paniculata*.

**Unit III**

Production technology for Medicinal solanum, Isabgol, Poppy, Safed musli, *Stevia rebaudiana*, *Mucuna pruriens*, *Ocimum* sp.

**Unit IV**

Post harvest handling – Drying, Processing, Grading, Packing and Storage, processing and value addition; GMP and Quality standards in herbal products.

**Unit V**

Influence of biotic and abiotic factors on the production of secondary metabolites, Regulations for herbal raw materials, Phytochemical extraction techniques.

**Unit VI**

Aromatic industry, WTO scenario, Export and import status, Indian perfumery industry, History, Advancements in perfume industry.

**Unit VII**

Production technology for palmarosa, lemongrass, citronella, vetiver, geranium, artemisia, mentha, ocimum, eucalyptus, rosemary, thyme, patchouli, lavender, marjoram, oreganum.

**Unit VIII**

Post-harvest handling, Distillation methods, advanced methods, Solvent extraction process, steam distillation, Perfumes from non-traditional plants, Quality analysis, Value addition, Aroma chemicals, quality standards and regulations.

**Unit IX**

Institutional support and international promotion of essential oil and perfumery products.

**Practical:** Botanical description, Propagation techniques, Maturity standards, Digital documentation, Extraction of secondary metabolites, Project preparation for commercially important medicinal crops, Visit to medicinal crop fields, Visit to herbal extraction units. Extraction of Essential oils, Project preparation for commercially important Aromatic crops, Visit to distillation and value addition units – Visit to CIMAP.

**Suggested Readings:**

1. Jain SK. 2000. Medicinal Plants. National Book Trust.
2. Hota D. 2007. Bio Active Medicinal Plants. Gene Tech Books.
3. Kurian A & Asha Sankar M. 2007. Medicinal Plants. Horticulture Science Series, New India Publ. Agency.
4. Skaria P Baby, Samuel Mathew, Gracy Mathew, Ancy Joseph, Ragina Joseph. 2007. Aromatic Plants. New India Publ. Agency.
5. Prajapati SS, Paero H, Sharma AK & Kumar T. 2006. A Hand book of Medicinal Plants. Agro Bios.
6. Ramawat KG & Merillon JM. 2003. Biotechnology: Secondary Metabolites. Oxford & IBH.

7. Farooqi AA, Khan MM & Vasundhara M. 2001. Production Technology of Medicinal and Aromatic Crops. Natural Remedies Pvt. Ltd.
8. Panda H. 2002. Medicinal Plants Cultivation and their Uses. Asia Pacific Business Press.
9. Khan IA & Khanum A. 2000. Role of Biotechnology in Medicinal and Aromatic Plants. Ukaaz Publ.
10. Farooqi AA & Sriram AH. 2000. Cultivation Practices for Medicinal and Aromatic Crops. Orient Longman Publ.
11. Atal CK & Kapur BM. 1982. Cultivation and Utilization of Aromatic Plants. RRL, CSIR, Jammu.
12. Atal CK & Kapur BM. 1982. Cultivation and Utilization of Medicinal Plants. RRL, CSIR, Jammu.

**M.Sc. (Ag.) Horticulture**  
**SEMESTER-II**  
**Syllabus: Tropical and Subtropical Fruit Production**  
**Paper Code: APH513**  
**w.e.f. Session 2018-19**

**3(2+1)**

Origin, history, distribution, commercial importance and export potential; climatic and soil requirements; species and varieties; root stocks and propagation; planting, floor and canopy management; nutrition and water requirement; major pests, diseases and their control measures; maturity indices and harvesting techniques of

**Unit-I**

Papaya, pineapple,

**Unit-II**

Cashew, Avocado, Sapota,

**Unit-III**

Jackfruit, Mango, Banana,

**Unit-IV**

Citrus, Grape, Guava, Litchi and Loquat.

**Practical:** Description and identification of species and varieties, cultural practices, nutritional and physiological disorders, maturity indices and harvesting techniques.

**Suggested Readings:**

1. Bose TK, Mitra SK & Sanyal D. 2001. (Eds.). Fruits -Tropical and Subtropical. Naya udyog.
2. Chadha KL & Pareek OP. 1996. (Eds.). Advances in Horticulture. Vols. IIIIV. Malhotra Publ. House.
3. Nakasone HY & Paul RE. 1998. Tropical Fruits. CABI.
4. Peter KV. 2008. (Ed.). Basics of Horticulture. New India Publ. Agency.
5. Pradeepkumar T, Suma B, Jyothibhaskar & Satheesan KN. 2008. Management of Horticultural Crops. Parts I, II. New India Publ. Agency.
6. Radha T & Mathew L. 2007. Fruit Crops. New India Publ. Agency.
7. Singh HP, Negi JP & Samuel JC. (Eds.). 2002. Approaches for Sustainable Development of Horticulture. National Horticultural Board.

**M.Sc. (Ag.) Horticulture**  
**SEMESTER-II**  
**Syllabus: Production Technology of Ornamental Plant**  
**Paper Code: APH517**  
**w.e.f. Session 2018-19**

**2(1+1)**

**Unit I**

Present status of Floriculture in India and its potential in the global market. Photoperiod, vernalization and growth regulators in floriculture.

**Unit II**

Commercial production of field flowers, bulbous, foliage and pot plants. Specific problems concerning production of roses, chrysanthemum, carnation, jasmine

**Unit III**

Marigold and other minor cut flower crops. Orchid and anthurium culture.

**Unit IV**

Production of essential oil yielding flowers. Project formulation and evaluation.

**Practical:** Identification of commercial cultivars. Cultural practices, harvesting, grading, packing and marketing of cut flowers, foliage and pot plants including roses, chrysanthemum, orchid, anthurium and marigold. Project formulation.

**Suggested Readings:**

1. Arora JS. 2006. Introductory Ornamental Horticulture. Kalyani.
2. Bhattacharjee SK. 2006. Advances in Ornamental Horticulture. Vols. I-VI. Pointer Publ.
3. Bose TK & Yadav LP. 1989. Commercial Flowers. Naya Prokash.
4. Bose TK, Maiti RG, Dhua RS & Das P. 1999. Floriculture and Landscaping. Naya Prokash.
5. Chadha KL & Chaudhury B.1992. Ornamental Horticulture in India. ICAR.
6. Chadha KL. 1995. Advances in Horticulture. Vol. XII. Malhotra Publ. House.
7. Lauria A & Ries VH. 2001. Floriculture – Fundamentals and Practices. Agrobios.
8. Prasad S & Kumar U. 2003. Commercial Floriculture. Agrobios

**M.Sc. (Ag.) Horticulture**  
**SEMESTER-II**  
**Syllabus: Production Technology of Warm Season Vegetable Crops**  
**Paper Code: AG511**  
**w.e.f. Session 2018-19**

**3(2+1)**

**Theory**

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

**Unit I**

Tomato, eggplant, hot and sweet peppers

**Unit II**

Okra, beans, cowpea and cluster bean

**Unit III**

Cucurbitaceous crops

**Unit IV**

Tapioca and sweet potato

**Unit V**

Green leafy warm season vegetables

**Practical:** 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.

**Suggested Readings:**

1. Bose TK, Kabir J, Maity TK, Parthasarathy VA & Som MG. 2003. Vegetable Crops. Vols. I-III. Naya Udyog.
2. Bose TK, Som MG & Kabir J. (Eds.). 2002. Vegetable Crops. Naya Prokash.
3. Chadha KL. (Ed.). 2002. Hand Book of Horticulture. ICAR.
4. Gopalakrishanan TR. 2007. Vegetable Crops. New India Publ. Agency.
5. Palaniswamy & Peter KV. 2007. Tuber Crops. New India Publ. Agency.
6. Rana MK. 2008. Olericulture in India. Kalyani.
7. Rana MK. 2008. Scientific Cultivation of Vegetables. Kalyani.
8. Saini GS. 2001. A Text Book of Oleri and Flori Culture. Aman Publ. House.
9. Singh DK. 2007. Modern Vegetable Varieties and Production Technology. International Book Distributing Co.
10. Singh NP, Bharadwaj AK, Kumar A & Singh KM. 2004. Modern Technology on Vegetable Production. International Book Distributing Co.
11. Thamburaj S & Singh N. 2004. Vegetables, Tuber Crops and Spices. ICAR.

**M.Sc. (Ag.) Horticulture**  
**SEMESTER-II**  
**Syllabus: Breeding of Vegetable Crops**  
**Paper Code: AG512**  
**w.e.f. Session 2018-19**

**3(2+1)**

**Theory**

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

**Unit I**

Potato and tomato

**Unit II**

Eggplant, hot pepper, sweet pepper and okra

**Unit III**

Peas and beans, amaranth, chenopods and lettuce

**Unit IV**

Gourds, melons, pumpkins and squashes

**Unit V**

Cabbage, cauliflower, carrot, beetroot, radish, sweet potato and tapioca

**Practical:** 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.

**Suggested Readings:**

1. Peter KV & Pradeepkumar T. 2008. Genetics and Breeding of Vegetables. Revised, ICAR.
2. Rai N & Rai M. 2006. Heterosis Breeding in Vegetable Crops. New India Publ. Agency.
3. Dhillon BS, Tyagi RK, Saxena S. & Randhawa GJ. 2005. Plant Genetic Resources: Horticultural Crops. Narosa Publ. House.
4. Singh PK, Dasgupta SK & Tripathi SK. 2004. Hybrid Vegetable Development. International Book Distributing Co.
5. Fageria MS, Arya PS & Choudhary AK. 2000. Vegetable Crops: Breeding and Seed Production. Vol. I. Kalyani.
6. Allard RW. 1999. Principles of Plant Breeding. John Wiley & Sons.
7. Kalloo G. 1998. Vegetable Breeding. Vols. I-III (Combined Ed.). Panima Edu. Book Agency.
8. Paroda RS & Kalloo G. (Eds.). 1995. Vegetable Research with Special Reference to Hybrid Technology in Asia-Pacific Region. FAO.
9. Kumar JC & Dhaliwal MS. 1990. Techniques of Developing Hybrids in Vegetable Crops. Agro Botanical Publ.

**M.Sc. (Ag.) Horticulture**  
**SEMESTER-II**  
**Syllabus: Technical Writing and Communications Skills**  
**Paper Code: PGS502**  
**w.e.f. Session 2018-19**

**1(0+1)**

**Practical: 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.

**Suggested Readings**

1. Wren PC & Martin H. 2006. High School English Grammar and Composition. S. Chand & Co.
2. Robert C. (Ed.). 2005. Spoken English: Flourish Your Language. Abhishek.
3. Mohan K. 2005. Speaking English Effectively. MacMillan India.
4. Sethi J & Dhamija PV. 2004. Course in Phonetics and Spoken English. 2nd Ed. Prentice Hall of India.
5. Hornby AS. 2000. Comp. Oxford Advanced Learner's Dictionary of Current English. 6th Ed. Oxford University Press.
6. Joseph G. 2000. MLA Handbook for Writers of Research Papers. 5th Ed. Affiliated East-West Press.
7. Chicago Manual of Style. 14th Ed. 1996. Prentice Hall of India.
8. Collins' Cobuild English Dictionary. 1995. Harper Collins.
9. James HS. 1994. Handbook for Technical Writing. NTC Business Books.
10. Gordon HM & Walter JA. 1970. Technical Writing. 3rd Ed. Holt, Rinehart & Winston.
11. Richard WS. 1969. Technical Writing. Barnes & Noble.



**M.Sc. (Ag.) Horticulture  
SEMESTER-II**

**Syllabus: Agricultural Research, Research Ethics and Rural Development Programmes (e-Course)**

**Paper Code: PGS505  
w.e.f. Session 2018-19**

**1(1+0)**

**Unit I**

History of agriculture in brief; Global agricultural research system: need, scope, opportunities; Role in promoting food security, reducing poverty and protecting the environment; National Agricultural Research Systems (NARS) and Regional Agricultural Research Institutions; Consultative Group on International Agricultural Research (CGIAR): International Agricultural Research Centers (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 II**

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

**Unit III**

Concept and connotations of rural development, rural development policies and strategies. Rural development programmes: Community Development Programme, Intensive Agricultural District Programme, Special group – Area Specific Programme, Integrated Rural Development Programme (IRDP) Panchayati Raj Institutions, Co-operatives, Voluntary Agencies/Non-Governmental Organizations. Critical evaluation of rural development policies and programmes. Constraints in implementation of rural policies and programmes.

**Suggested Readings:**

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

**M.Sc. (Ag.) Horticulture**  
**SEMESTER-II**  
**Syllabus: Disaster Management (e-Course)**  
**Paper Code: PGS506**  
**w.e.f. Session 2018-19**

**1(1+0)**

**Unit I**

Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, Drought, Cyclone, Earthquakes, Landslides, Avalanches, Volcanic eruptions, Heat and cold Waves, Climatic Change: Global warming, Sea Level rise, Ozone Depletion.

**Unit II**

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.

**Unit III**

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, Community-based organizations, and media. Central, State, District and local Administration; Armed forces in Disaster response; Disaster response: Police and other organizations.

**Suggested Readings:**

1. Gupta HK. 2003. Disaster Management. Indian National Science Academy. Orient Blackswan.
2. Hodgkinson PE & Stewart M. 1991. Coping with Catastrophe: A Handbook of Disaster Management. Routledge.
3. Sharma VK. 2001. Disaster Management. National Centre for Disaster Management, India.