

DEPARTMENT OF HORTICULTURE

H.N.B. Garhwal University, Srinagar (Garhwal), Uttarakhand, India-246 174

Curriculum and Syllabus for Ph.D. (Horticulture), 2019-20

Core Courses

Course No.	Course Title	Credits
SOA/HC/ 601	Research Methodology & Computer Applications	4 (3+1)
SOA/HC/ 602	Research and Publication Ethics	2(1+1)
SOA/HC/ 603	Seminar	1 (0+1)
	Total	7(4+3)

Elective Courses

The candidate will have to take any two elective courses

SOA/HE/ 601	Advances in Production of Fruit Crops	4(3+1)
SOA/HE/ 602	Advances in Vegetable Production	4 (3+1)
SOA/HE/ 603	Advances in Growth Regulation of Fruit Crops	4(3+1)
SOA/HE/ 604	Biodiversity and Conservation of Fruit Crops	4(3+1)

Ph.D. Thesis Research

SOA/HC/ 700	Ph.D. Thesis	Non-credit
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Course no.	Paper Title	Total marks	Theory marks		Practical marks	credits
			I	E		
Core						
SOA/HC/ 601	Research Methodology & Computer Applications	100	80 (20	+ 60)	20	3+1
SOA/HC/ 602	Research and Publication Ethics	100	80 (20	+ 60)	20	1+1
SOA/HC/ 603	Seminar	100	80 (20	+ 60)	20	0+1
Elective						
The candidate will have to take any two elective courses						
SOA/HE/ 601	Advances in Production of Fruit Crops	100	80 (20	+ 60)	20	3+1
SOA/HE/ 602	Advances in Vegetable Production	100	80 (20	+ 60)	20	3+1
SOA/HE/ 603	Advances in Growth Regulation of Fruit Crops	100	80 (20	+ 60)	20	3+1
SOA/HE/ 604	Biodiversity and Conservation of Fruit Crops	100	80 (20	+ 60)	20	3+1

I - Internal Assessment

E - External Assessment

Core Courses

SOA/HC/601: Research Methodology & Computer Applications **4(3+1)**

Research Design and Data Collection: Research methodology- definition, different types of research design. Basic principles of experimental designs. Sampling design- sample survey, steps in sample design, criteria of selecting a sampling procedure and different types of sample designs. Methods of Data Collection: Primary and secondary

data. Literature collection and citation, bibliography. Writing skills - Preparation of research report, presentations, and writing scientific paper. Impact factor, Citation index, Ethics in research; Plagiarism, ISBN, ISSN.

Processing and Analysis of Data and Sampling: Processing operations, elements/types of analysis, statistics in research, Simple regression and correlation.

Testing of Hypotheses: Basic concepts of testing of hypothesis, procedures for hypothesis testing. Hypothesis testing for differences between means, hypothesis testing for comparing two related samples. Testing the equality of variances of two normal populations, hypothesis testing of correlation coefficient. Chi square test

Analysis of Variance and Covariance: Analysis of Variance and Covariance (basic principles of one-way ANOVA, two-way ANOVA and ANCOVA).

Application of Computer in Research: MS office and its application in Research – MS Word, MS Power point and MS Excel; Basic principles of Statistical Computation using SPSS; Use of Internet in Research – Websites, search Engines, E-journal and E-Library – INFLIBNET.

Practicals

Based on above topics.

SOA/HC/ 602: Research and Publication Ethics **2(1+1)**

Philosophy and Ethics

- Introduction to Philosophy: definition, nature and scope, concept, branches
- Ethics: definition, moral philosophy, nature of moral judgements and reactions

Scientific Conduct

- Ethics with respect to science and research
- Intellectual honesty and research integrity
- Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP)
- Redundant publications: duplicate and overlapping publications, salami slicing
- Selective reporting and misrepresentation of data

Publication Ethics

- Publication ethics: definition, introduction and importance
- Best practices / standards setting initiatives and guidelines: COPE, WAME, etc.
- Conflicts of interest
- Publication misconduct: definition, concept, problems that lead to unethical behaviour and vice -versa, types
- Violation of publication ethics, authorship and contributorship
- Identification of publication misconduct, complaints and appeals
- Predatory publishers and journals

Practicals

Open Access Publishing

- Open access publications and initiatives
- SHERPA/ RoMEO online resource to check publisher copyright & self- archiving policies
- Software tool to identify predatory publications developed by SPPU
- Journal finder / journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggester, etc.

Publication Misconduct

Group Discussions

- Subject specific ethical issues, FFP, authorship
- Conflicts of interest
- Complaints and appeals: examples and fraud from India and abroad

Software tools

Use of plagiarism software like Turnitin, Urkund and other open source software tools

Databases and Research Metrics

Databases

- Indexing databases
- Citation databases: Web of Science, Scopus, etc.

Research Metrics

- Impact Factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score
- Metrics: h- index, g index, i10 index, altmetrics

ELECTIVE COURSES

The candidate will have to take any two elective courses

SOA/HE/ 601: Advances in Production of Fruit Crops (3+1)

National and International scenario in fruit production, Recent advances in propagation - root stock influence, planting systems, high density planting, crop modeling , precision farming, decision support systems - aspects of crop regulation- physical and chemical regulation effects on physiology and development, influence of stress factors, strategies to overcome stress effects, integrated and modern approaches in water and nutrient management, canopy development and management, total quality management(TQM) - Current topics.

Mango and Banana

Papaya, Grapes and Citrus Fruits

Guava, Sapota, Pomegranate and Aonla

Pineapple, Avocado, Jack fruit and Fig

Apple, Pear, Plums, Peach, Apricot, Cherries, Nut crops, kiwi and Strawberry

Practicals

Survey of existing fruit cropping systems and development of a model cropping system, Estimating nutrient deficiency- estimation of water use efficiency, soil test-crop response correlations, practices in plant growth regulation, studying physiological and biochemical responses, quality analysis.

SOA/HE/ 602: Advances in Vegetable Production 4(3+1)

Present status and prospects of vegetable cultivation; nutritional and medicinal values; types of gardening; climate and soil as critical factors in vegetable production; choice of varieties; nursery management; modern concepts in water and weed management; physiological basis of growth, yield and quality as influenced by chemicals and growth regulators; role of organic manures, inorganic fertilizers, micronutrients and biofertilizers; response of genotypes to low and high nutrient management, nutritional deficiencies, physiological disorders; different cropping systems; mulching; containerized culture for round the year vegetable production; low cost polyhouse; net house production; crop modeling, organic gardening; vegetable production for pigments, export and processing of the following vegetables:-

Solanaceous Vegetables- Potato, Tomato, Brinjal, Chilli, Capsicum

Root Vegetables- Radish, Turnip, Carrot

Cole Vegetables- Cauliflower, Cabbage, Knol-khol

Legume Vegetables- Peas and French bean

Bulb Vegetables- Onion, Garlic

Cucurbits- Cucumber, Water melon, Bottle gourd, Sponge gourd, Musk melon, Pumpkin

Leafy Vegetables- Spinach, Amaranthus

Okra, Tapioca and Sweet Potato

Practicals

Identification and morphological features of vegetables ,seed hardening treatments; practices in indeterminate and determinate vegetable growing and organic gardening; identification of nutritional and physiological disorders; use of plant growth regulators; maturity indices; dryland techniques for rainfed vegetable production; vegetable waste recycling management; quality analysis; visit to vegetable farm.

SOA/HE/ 603: Advances in Growth Regulation of Fruit Crops 4(3+1)

Ecophysiological aspects of growth and development of fruit crops. Structure, biosynthesis, absorption, translocation and degradation of Plant growth regulators. Morphogenetic effects of different Plant Growth Regulators. Physiology of action of PGRs on growth and development of fruit crops including root and canopy regulation, flowering, fruit set, crop load and assimilate partitioning and distribution. Role of PGRs in canopy management for fertigated orchards.

Growth regulation aspects of propagation, embryogenesis, seed and bud dormancy, fruit bud initiation, regulation of flowering, off season production.

Flower drop and thinning, fruit drop, parthenocarpy, fruit maturity and ripening and storage, molecular approaches in crop growth regulation- current topics.

Practicals

Root- shoot studies, quantifying the physiological and biochemical effects of physical and chemical growth regulation, bioassay and isolation through chromatographic analysis for auxins, gibberellins, experiments on growth regulation during propagation, dormancy, flowering, fruitset and fruit development stages.

SOA/HE/ 604: Biodiversity and Conservation of Fruit Crops 4(3+1)

Biodiversity and conservation; issues and goals, primary and secondary centers of genetic diversity; centers of origin of cultivated fruits.

Present status of gene centers; exploration and collection of germplasm; conservation of genetic resources ; *in situ* and *ex situ* conservation.

Inventory of germplasm, GIS and documentation of local biodiversity, introduction of germplasm, detection of genetic constitution of germplasm and maintenance of core group.

Plant quarantine.

Germplasm Conservation- cryopreservation, problem of recalcitrance, cold storage of scions, tissue culture, pollen and seed storage;

Intellectual property rights with focus on Geographical indication with reference to available germplasm of temperate fruit crops of the region. Regulatory horticulture.

Crops

Mango, Sapota, Citrus, Guava, Banana, Papaya, Grapes, Jackfruit, Custard apple, Ber, Aonla, Apple, Pear, Peach, Plum, Litchi, Nuts, Coffee, Tea, Rubber, Cashew, Coconut, Cocoa, Palmyrah, Arecanut, and Oil palm.

Practicals

Documentation of germplasm – maintenance of passport data and other records of accessions; field exploration trips, exercise on *ex situ* conservation – cold storage, pollen/seed storage, cryopreservation, visits to National Gene Bank and other centers of PGR activities. Detection of genetic constitution of germplasm, core sampling, germplasm characterization using molecular techniques.