



Department of Horticulture
Mahatma Phule Krishi Vidyapeeth
Rahuri-413 722, Dist. Ahmednagar (MS)



Doctoral Programme in Fruit Science

Course Layout

Minimum Credit Requirements

Sr. No.	Subject	Minimum credit(s)
1	Major	18
2	Minor	08
3	Supporting	05
4	Seminar	02
5	Research	45
	Total Credits	78
6	Compulsory Non Credit Courses	04

Sr. No.	Course Number	Course Title	Credits
A) Major Subjects (Min. 18 credits)			
1	FSC - 505	Propagation and Nursery Management for Fruit Crops	2+1=3
2	FSC - 601	Advances In Breeding of Fruit Crops	2+1=3
3	FSC - 602	Advances In Production of Fruit Crops	2+1=3
4	FSC - 603	Advances In Growth Regulation of Fruit Crops	2+1=3
5	FSC - 605	Biotic and Abiotic Stress Management in Horticultural Crops	2+1=3
6	FSC-606	Systematics of Fruit Crops	2+1=3
B) Minor Subjects (Min. 08 credits)			
1	VSC - 603	Protected Cultivation of Vegetable Crops	2+1=3

2	PP - 605	Climate Change and Crop Growth	2+0=2
3	BIOCHEM - 603	Bio-chemistry of Biotic and Abiotic Stress	3+0=3
C) Supporting Subjects (Min. 05 credits)			
1	STAT-601	Advanced Statistical Methods	2+1=3
2	FST-606	Food Analysis	0+2=2
D) Seminar (02 credits)			
1	FSC-691	Doctoral Seminar I	1+0=1
2	FSC-692	Doctoral Seminar II	1+0=1
E) Doctoral Research (45 credits)			
1	FSC - 699	Doctoral Research	0+45=45
F) Non Credit Compulsory Courses			
1	PGS - 501	Library and Information Services	0+1=2
2	PGS - 504	Basic Concepts in Laboratory Techniques	0+1=2
3	PGS - 502	Technical Writing and Communication Skills	0+1=2
4	PGS - 503	Intellectual Property and its Management In Agriculture	0+1=2

Course Contents

Major Subjects

Course No.	: FSC 505
Course title	: PROPAGATION AND NURSERY MANAGEMENT FOR FRUIT CROPS
Credits	: 2+1

Theory:

Unit-I	:	Introduction, life cycles in plants, cellular basis for propagation. Sexual propagation, apomixis, poly-embryony, chimeras. Principle factors influencing seed germination of horticultural crops, dormancy. Hormonal regulation of germination and seedling growth.
Unit-II	:	Seed quality, treatment, packing, storage, certification, testing. Asexual propagation-rooting of soft and hard wood cutting under mist by growth regulators. Rooting of cuttings in hotbeds Physiological, anatomical and biochemical aspects of root induction in cuttings. Layering – principle and methods
Unit-III	:	Budding and grafting – selection of elite mother plants, methods. Establishment of bud wood bank, stock, scion and inter stock, relationship –Incompatibility. Rejuvenation through top working. Progeny orchard and scion bank.
Unit-IV	:	Micro-propagation-principles and concepts, commercial exploitation in horticultural crops. Techniques - in vitro clonal propagation, direct organogenesis, embryogenesis, micro-grafting, meristem culture. Hardening, packing and transport of micro-propagules.
Unit-V	:	Nursery-types, structures, components, planning and layout. Nursery management practices for healthy propagule production. Nursery act.

Practical:

Anatomical studies in rooting of cutting and graft union. Construction of propagation structures, study of media and PGR. Hardening – case studies, micro-propagation, explant preparation. Media preparation, culturing – <i>in vitro</i> clonal propagation. Meristem culture, shoot tip culture, axillary bud culture. Direct organogenesis, direct and indirect embryogenesis, micro grafting and hardening. Visit to TC labs and nurseries.	
Practical No.	Topic
1-2	Anatomical studies in rooting of cutting and graft union
3-4	Construction of propagation structures, study of media and PGR
5-6	Hardening – case studies, micro-propagation, explant preparation
7-8	Media preparation, culturing – <i>in vitro</i> clonal propagation

9-10	Meristem culture, shoot tip culture, axillary bud culture.
11-13	Direct organogenesis, direct and indirect embryogenesis, micro grafting, hardening
14-16	Visit to TC labs and nurseries

Reference Books:

Hartmann HT & Kester DE. 1989. Plant Propagation – Principles and Practices. Prentice Hall of India.

Bose TK, Mitra SK & Sadhu MK. 1991. Propagation of Tropical and Subtropical Horticultural Crops. Naya Prokash.

Peter KV. (Ed.). 2008. Basics of Horticulture. New India Publ. Agency.

Singh SP. 1989. Mist Propagation. Metropolitan Book Co.

Rajan S & Baby LM. 2007. Propagation of Horticultural Crops. New India Publ. Agency.

Radha T & Mathew L. 2007. Fruit Crops. New India Publ. Agency.

Course No. : FSC 601
Course Title : ADVANCES IN BREEDING OF FRUIT CROPS
Credits : 2+1=3

Theory:

Evolutionary mechanisms, adaptation and domestication, Genetic resources, cytogenetics, cytomorphology, chemotaxonomy, genetics of important traits and their inheritance pattern, variations and natural selection, spontaneous mutations, incompatibility systems in fruits, recent advances in crop improvement efforts- introduction and selection, chimeras, apomixis, clonal selections, inter-generic, inter-specific and inter-varietal hybridization, mutation and polyploidy breeding, resistance breeding to biotic and abiotic stresses, breeding for improving quality, molecular and transgenic approaches in improvement of selected fruit crops.

Unit-I	:	Mango and banana
Unit-II	:	Papaya, grapes and citrus
Unit-III	:	Guava and sapota
Unit-IV	:	Pineapple and avocado
Unit-V	:	Apple, pear, plums, peaches, apricot, cherries and strawberry

Practical:

Description and cataloguing of germplasm. Pollen viability tests. Pollen germination-isozyme techniques-survey and clonal selection. Observations on pest, disease and stress reactions in inbreds and hybrids. Use of mutagenes and colchicine for inducing mutation and ploidy changes. Practices in different methods of breeding fruit crops and in-vitro breeding techniques.	
Practical No.	Topic
1	Description and cataloguing of germplasm
2-4	Pollen viability tests
5-7	Pollen germination-isozyme techniques-survey and clonal selection
8-9	Observations on pest, disease and stress reactions in inbreds and hybrids
10-11	Use of mutagenes and colchicine for inducing mutation and ploidy changes
12-16	Practices in different methods of breeding fruit crops and in-vitro breeding techniques

Reference Books:

- Bose TK, Mitra SK & Sanyal D. (Ed.). 2002. Fruits of India – Tropical and Sub-tropical. 3rd Ed. Vols. I, II. Naya Udyog.
- Chadha KL & Pareek OP. (Eds.). 1996. Advances in Horticulture. Vol. I. Malhotra Publ. House.
- Chadha KL & Shikhamany SD. 1999. The Grape: Improvement, Production and Post-Harvest Management. Malhotra Publ. House.
- Gowen S. 1996. Banana and Plantains. Chapman & Hall.
- Janick J & Moore JN. 1996. Fruit Breeding. Vols.I-III. John Wiley & Sons.
- Nijjar GS. (Ed.). 1977. Fruit Breeding in India. Oxford & IBH.
- Radha T & Mathew L. 2007. Fruit Crops. New India Publ. Agency.
- Singh S, Shivankar VJ, Srivastava AK & Singh IP. (Eds.). 2004. Advances in Citriculture. Jagminder Book Agency.
- Stover RH & Simmonds NW. 1991. Bananas. Longman.

Course No.	: FSC 602
Course title	: ADVANCES IN PRODUCTION OF FRUIT CROPS
Credits	: 2+1=3

Theory:

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, , Total quality management(TQM) - Current topics of following selected fruit crops :		
Unit-I	:	Mango and banana
Unit-II	:	Papaya, grapes and citrus
Unit-III	:	Guava, sapota, pomegranate and aonla
Unit-IV	:	Pineapple, avocado, jack fruit and fig
Unit-V	:	Apple, pear, plums, strawberry, peach, apricot, cherries and nut crops

Practical:

Survey of existing fruit cropping systems. 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,	
Practical No.	Topic
1	Survey of existing fruit cropping systems
2-4	Development of a model cropping system
5-6	Estimating nutrient deficiency
7-8	Estimation of water use efficiency
9-11	Soil test-crop response correlations
12-13	Practices in plant growth regulation
14-15	Studying physiological and biochemical responses
16	Quality analysis

Reference Books:

Bose TK, Mitra SK & Rathore DS. (Eds.). 1988. Temperate Fruits-Horticulture. Allied Publ.
Bose TK, Mitra SK & Sanyal D. (Eds.). 2001. Fruits -Tropical and Subtropical. Naya Udyog.
Bose TK, Mitra SK, Farooqi AA & Sadhu MK. 1999. Tropical Horticulture. Vol. I. Naya Prokash.
Chadha KL & Pareek OP. (Eds.).1996. Advances in Horticulture. Vols. II-IV. Malhotra Publishing House.
Chadha KL. 2001. Handbook of Horticulture. ICAR.
Nakasone HY & Paull RE. 1998. Tropical Fruits. CABI.
Radha T & Mathew L. 2007. Fruit Crops. New India Publ. Agency.

Course No. : FSC 603
Course title : ADVANCES IN GROWTH REGULATION OF FRUIT CROPS
Credits : 2+1=3

Theory:

Unit-I	Eco-physiological influences on growth and development of fruit crops- flowering, fruit set- Crop load and assimilate partitioning and distribution.
Unit-II	Root and canopy regulation, study of plant growth regulators in fruit culture- structure, biosynthesis, metabolic and morphogenetic effects of different plant growth promoters and growth retardants.
Unit-III	Absorption, translocation and degradation of phytohormones – internal and external factors influencing hormonal synthesis, biochemical action, growth promotion and inhibition, canopy management for fertigated orchards.
Unit-IV	Growth regulation aspects of propagation, embryogenesis, seed and bud dormancy, fruit bud initiation, regulation of flowering, off season production.
Unit-V	Flower drop and thinning, fruit set and development, fruit drop, parthenocarp, fruit maturity and ripening and storage, molecular approaches in crop growth regulation- current topics.

Practical:

Root- shoot studies (Any one crop). Quantifying the physiological and biochemical effects of physical and chemical growth regulation. Bioassay and isolation through chromatographic analysis for gibberellins and cytokinins. Experiments on growth regulation during propagation, dormancy, flowering, fruit set and fruit development stages.

Practical No.	Topic
1-2	Root- shoot studies (Any one crop)
3-6	Quantifying the physiological and biochemical effects of physical and chemical growth regulation
7-10	Bioassay and isolation through chromatographic analysis for gibberellins and cytokinins
11-16	Experiments on growth regulation during propagation, dormancy, flowering, fruit set and fruit development stages

Reference Books:

Buchanan B, Gruissem W & Jones R. 2002. Biochemistry & Molecular Biology of Plants. John Wiley & Sons.

Epstein E. 1972. Mineral Nutrition of Plants: Principles and Perspectives. Wiley.

Fosket DE. 1994. Plant Growth and Development: A Molecular Approach. Academic Press.

Leopold AC & Kriedemann PE. 1985. Plant Growth and Development. 3rd Ed. McGraw-Hill.

Radha T & Mathew L. 2007. Fruit Crops. New India Publ. Agency.

Roberts J, Downs S & Parker P. 2002. Plant Growth Development. In: Plants (I. Ridge, Ed.), pp. 221-274, Oxford University Press.

Salisbury FB & Ross CW. 1992. Plant Physiology. 4th Ed. Wadsworth Publ.

Course No.	: FSC 605
Course title	: BIOTIC AND ABIOTIC STRESS MANAGEMENT IN HORTICULTURAL CROPS
Credits	: 2+1=3

Theory:

Unit-I	:	Stress-definition, classification, stresses due to water (high and low), temperature (high and low), radiation, wind, soil conditions (salinity, alkalinity, ion toxicity, fertilizer toxicity, etc.).
Unit-II	:	Pollution - increased level of CO ₂ , industrial wastes, impact of stress in horticultural crop production, stress indices, physiological and biochemical factors associated with stress, horticultural crops suitable for different stress situations.
Unit-III	:	Crop modeling for stress situations, cropping system, assessing the stress through remote sensing, understanding adaptive features of crops for survival under stress, interaction among different stress and their impact on crop growth and productivity.
Unit-IV	:	Greenhouse effect and methane emission and its relevance to abiotic stresses, use of anti transpirants and PGRs in stress management, mode of action and practical use, HSP inducers in stress management techniques of soil moisture conservation, mulching, hydrophilic polymers.
Unit-V	:	Rain water harvesting, increasing water use efficiency, skimming technology, contingency planning to mitigate different stress situations, cropping systems, stability and sustainability indices.

Practical:

Seed treatment /hardening practices. Container seedling production. Analysis of soil moisture estimates (FC, ASM, PWP). Analysis of plant stress factors. RWC, chlorophyll fluorescence, chlorophyll stability index. ABA content. Plant waxes. Stomatal diffusive resistance. Transpiration, photosynthetic rate etc. under varied stress situations. Influence of stress on growth and development of seedlings and roots. Biological efficiencies. WUE. Solar energy conversion and efficiency. Crop growth sustainability indices. Economics of stress management. Visit to orchards and water shed locations.	
Practical No.	Topic
1	Seed treatment /hardening practices
2	Container seedling production

3	Analysis of soil moisture estimates (FC, ASM, PWP)
4	Analysis of plant stress factors
5	RWC, chlorophyll flurescence, chlorophyll stability index
6	ABA content
7	Plant waxes
8	Stomatal diffusive resistance
9	Transpiration, photosynthetic rate etc. under varied stress situations
10	Influence of stress on growth and development of seedlings and roots
11	Biological efficiencies
12	WUE
13	Solar energy conversion and efficiency
14	Crop growth sustainability indices
15	Economics of stress management
16	Visit to orchards and water shed locations

Reference Books:

- Blumm A. 1988. Plant Breeding for Stress Environments. CRC.
- Christiansen MN & Lewis CF. 1982. Breeding Plants for Less Favourable Environments. Wiley Inter. Science.
- Gupta US. 1990. Physiological Aspects of Dry Farming.
- Hsiao TC. 1973. Plant Responses to Water Stress. Ann. Rev. Plant Physiology 24: 519-570.
- Kramer PJ. 1980. Drought Stress and the Origin of Adaptation. In: Adaptation of Plants to Water and High Temperature Stress. John Wiley & Sons.
- Levitt J. 1972. Response of Plants to Environmental Stresses. Academic Press.
- Maloo SR. 2003. Abiotic Stress and Crop Productivity. Agrotech Publ. Academy.
- Mussell H & Staples R. 1979. Stress Physiology in Crop Plants. Wiley Inter. Science.
- Nickell LG. 1983. Plant Growth Regulating Chemicals. CRC.
- Peter KV. (Ed.). 2008. Basics of Horticulture. New India Publ. Agency.
- Turener NC & Kramer PJ. 1980. Adaptation of Plants to Water and High Temperature Stress. John Wiley & Sons.

Course No.	: FSC 606	
Course title	: Systematics of Fruit Crops	Credits : 3 (2+1)

Theory:

Unit-I	:	Systematic pomology: Definition and importance, Principles of taxonomy, different methods of classification and nomenclature.
Unit-II	:	Classification of temperate, tropical and subtropical fruits and plantation crops. Origin, history, evolution and distribution of fruit plantation crops- Apple, pear, plum, strawberry, mango, banana, pineapple, jackfruit, sapota, papaya, guava, ber, annona, citrus, pomegranate, aonla, fig, coconut, areca nut and cashew nut.
Unit-III	:	Botanical description of families, genera and species covering important temperate, tropical and subtropical fruit crops.
Unit-IV	:	Cytological levels of various fruit crops; descriptive keys for important fruit crops and pomological descriptors of varieties.
Unit-V	:	Importance of molecular markers in evaluation of fruit crops, molecular markers as an aid in characterization and taxonomy of fruit crops.

Practical:

Identification, description, classification of fruit crop species and varieties Description and collection of allied species and local varieties Preparation and use of keys for identifying varieties and species of temperate, tropical and subtropical fruit crops (descriptors) Methods of preparation of herbarium and specimens catalogue	
Practical No.	Topics
1-3	Identification, description, classification of fruit crop species and varieties
4-7	Description and collection of allied species and local varieties
8-13	Preparation and use of keys for identifying varieties and species of temperate, tropical and subtropical fruit crops (descriptors)
14-16	Methods of preparation of herbarium and specimens catalogue

Reference books:

1. Chopra G. L. 1968. <i>Angiosperms – systematic and life cycles</i> . S. Nagin
2. Dutta A.C. 1986. A class book of botany. Oxford University Press.
3. Pandey B. P. 1999. Taxonomy of Angiosperm S. Chand and Co.
4. Bose T. K. (Ed). 1990. Fruits of India- Tropical and Subtropical. Naya Prokash, Kolkatta
5. Purseglove, J.W.L. 1979. Tropical crops- Monocotyledons Vol. 1. Longmans London
6. Purseglove, J.W.L. 1979. Tropical crops- Dicotyledons Vol. 2. Longmans, London
7. Chadha K.L. (Ed). 2001. Handbook of Horticulture. ICAR.
8. Chadha K.L. and Parekh O. P. (Ed). 1993. Advances in Horticulture Vol. 1-4 Malhotra Publ. House, New Delhi.
9. Sharma G, Sharma, O. C. Thakur, B. S. 2009. Systematics of fruit crops. New India Publ

Minor Subject**Course No. : VSC 603****Title : PROTECTED CULTIVATION OF VEGETABLE CROPS****Credits : 2+1=3****Theory:**

Unit-I	:	Importance and scope of protected cultivation of vegetable crops; principles used in protected cultivation, energy management, low cost structures; engineering aspects.
Unit-II	:	Regulatory structures used in protected structures; types of greenhouse/polyhouse/net house, cold frames, effect of environmental factors, viz. temperature, light, CO ₂ and humidity on growth of different vegetables, manipulation of CO ₂ , light and temperature for vegetable production, fertigation.
Unit-III	:	Nursery raising in protected structures like poly-tunnels, types of benches and containers, different media for growing nursery under cover.
Unit-IV	:	Regulation of flowering and fruiting in vegetable crops, technology for raising tomato, sweet pepper, cucumber and other vegetables in protected structures, training and staking in protected crops, varieties and hybrids for growing vegetables in protected structures.
Unit-V	:	Problem of growing vegetables in protected structures and their remedies, insect and disease management in protected structures; use of protected structures for seed production.

Practical:

Study of various types of structures. Study of different methods to control temperature, CO ₂ and light. Study of soil and soil less media. Study of training and pruning in vegetable crops. Study of fertigation and nutrient management under protected structure. Study of insect pests and diseases in greenhouse and its control. Study of hybrid seed production of vegetables. Economics of protected cultivation (Any one crop). Visit to established green/polyhouse/ shade net house in the region.	
Practical No.	Topic
1-2	Study of various types of structures
3-4	Study of different methods to control temperature, CO ₂ and light
5	Study of soil and soil less media
6	Study of training and pruning in vegetable crops

7-8	Study of fertigation and nutrient management under protected structure
9-10	Study of insect pests and diseases in greenhouse and its control
11-12	Study of hybrid seed production of vegetables
13-14	Economics of protected cultivation (Any one crop)
15-16	Visit to established green/polyhouse/ shade net house in the region

Reference Books:

Anonymous (2003). Proc. All India Seminar on Potential and Prospects for Protective Cultivation. Organised by Institute of Engineers, Ahmednagar. Dec.12-13, 2003.

Chandra S & SomV. (2000). Cultivating Vegetables in Green House. Indian Horticulture 45: 17-18.

Prasad S & Kumar U. (2005). Greenhouse Management for Horticultural Crops. 2nd Ed. Agrobios.

Tiwari GN. (2003). Green House Technology for Controlled Environment. Narosa Publ. House.

Chadha KL & Kalloo G. (Eds.). (1993-94). Advances in horticulture. Malhotra Pub I. House.

Kalloor G & Singh K (Ed.). (2000). Emerging Scenario in Vegetable Research and Development. Research Periodicals & Book Publ. House.

PP - 605	Climate Change and Crop Growth	2+0=2
BIOCHEM - 603	Biochemistry of Biotic and Abiotic Stress	3+0=3

Supporting Subjects (Min. 05 credits)			
1	STAT-601	Advanced Statistical Methods	2+1=3
2	FST-606	Food Analysis	0+2=2
Seminar (02 credits)			
1	FSC-691	Doctoral Seminar I	1+0=1
2	FSC-692	Doctoral Seminar II	1+0=1
Doctoral Research (45 credits)			
1	FSC - 699	Doctoral Research	0+45=45

Non Credit Compulsory Courses		
PGS 501	Library and Information Services	1 (0+1)

Practical:
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; eresources access methods.

PGS 504	Basic Concepts in Laboratory Techniques	1 (0+1)
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Practical:
Safety measures while in Lab; Handling of chemical substances; Use of burettes, pipettes, measuring cylinders, flasks, separatory funnel, condensers, micropipettes and vaccupets; 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, sandbath, waterbath, oilbath; 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

Suggested Books:

1. Furr AK. 2000. CRC Hand Book of Laboratory Safety. CRC Press.
2. Gabb MH & Latchem WE. 1968. A Handbook of Laboratory Solutions. Chemical Publ. Co.

PGS 502	Technical Writing and Communications Skills	1 (0+1)
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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 Books:

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

PGS 503 (e-Course) Intellectual Property and its Management in Agriculture 1 (1+0)

Theory:

Historical perspectives and need for the introduction of Intellectual Property Right regime; TRIPs and various provisions in TRIPS Agreement; Intellectual Property and Intellectual Property Rights (IPR), benefits of securing IPRs; Indian Legislations for the protection of various types of Intellectual Properties; Fundamentals of patents, copyrights, geographical indications, designs and layout, trade secrets and traditional knowledge, trademarks, protection of plant varieties and farmers' rights and biodiversity protection; Protectable subject matters, protection in biotechnology, protection of other biological materials, ownership and period of protection; National Biodiversity protection initiatives; Convention on Biological Diversity; International Treaty on Plant Genetic Resources for Food and Agriculture; Licensing of technologies, Material transfer agreements, Research collaboration Agreement, License Agreement.

Suggested 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.
3. Intellectual Property Rights: Key to New Wealth Generation. 2001. NRDC & Aesthetic Technologies.
4. Ministry of Agriculture, Government of India. 2004. State of Indian Farmer. Vol. V. Technology Generation and IPR Issues. Academic Foundation.
5. Rothschild M & Scott N. (Ed.). 2003. Intellectual Property Rights in Animal Breeding and Genetics. CABI.
6. Saha R. (Ed.). 2006. Intellectual Property Rights in NAM and Other Developing Countries: A Compendium on Law and Policies. Daya Publ. House.
7. The Indian Acts - Patents Act, 1970 and amendments; Design Act, 2000;
8. Trademarks Act, 1999; The Copyright Act, 1957 and amendments; Layout
9. Design Act, 2000; PPV and FR Act 2001, and Rules 2003; National Biological Diversity Act, 2003.