

Department of Agroforestry

Name of the degree M.Sc. Forestry (Plantation Technology)

Courses offer

Group		Number	Title of Course	Credit
Major	1.	FOR 501	Silviculture	2+0
	2.	FOR 502	Forest Biometry	1+1
	3.	FOR 503	Forest Management	2+0
	4.	FOR 504	Forest Products-Chemistry & Industries	2+1
	5.	FOR 505	Forest Ecology & Biodiversity Conservation	2+1
	6.	FOR 506	Forest Resources Management & Economics	1+1
	7.	FOR 507	Forest Protection	1+1
	8.	FOR 508	Forest Policy , Laws & International Convention	2+0
	9.	FOR 509	Tree Improvement	1+1
	10.	FOR 510	Forest & People	2+0
	Total			22 (16+6)
Seminar	1.	FOR 591	Credit Seminar	1(0+1)
Thesis research	1.	FOR 599	Research	20(0+20)
Minor	1.	FOR PT 521	Seed Collection, Storage & Testing	2+1
	2.	FOR PT 522	Modern Nursery Technology	1+1
	3.	FOR PT 523	Nutrient & Weed Management in Nursery & Plantation	2+1
	4.	FOR PT 524	Management of Insect-Pests & Diseases	1+1
	5.	FOR PT525	Energy Plantation and Bio fuel	1+1
	Total			12(7+5)
Supporting	1.	FOR 511	Computer Application & Information Technology	1 (0+1)
	2.	FOR 512	Remote Sensing & Geographic Information System	2 (1+1)
	3.	FOR 513	General Statistical Methods & Research Methodology	2 (1+1)
	Total			5 (2+3)
Non-Credit Compulsory Course	1.	PGS 501	Library and Information Services	1(0+1)
	2.	PGS 502	Technical Writing and Communications Skills	1(0+1)
	3.	PGS 503	Intellectual Property and its Management in Agriculture	1(1+0)
	4.	PGS 504	Basic Concepts in Laboratory Techniques	1(0+1)
	5.	PGS 505	Agril Res. Ethics and Rural Dev. Programs	1(1+0)
	6.	PGS 506	Disaster Management	1(1+0)
	7.	HVE	Human value and Professional Ethics	2(1+1)
Total			8(4+4)	
Grand total			86(43+43)	

Department of Agroforestry

Degree M.Sc. Forestry (Plantation Technology)

Minimum credit requirements

Subject	Master
Major	22
Minor	12
Supporting	05
Seminar	01
Thesis research	20
Total	60

Department of Forestry

Programme **M.Sc. Forestry (Plantation Technology)**

Semester wise distribution of Courses

Course	Course Title	Code	Credit
Semester I			
Major	Silviculture	FOR-501	2(2+0)
	Forest Biometry	FOR-502	2(1+1)
	Forest Management	FOR-503	2(2+0)
	Forest & People	FOR-510	2(2+0)
	Forest Resource Management & Economics	FOR-506	2(1+1)
	Forest Ecology & Biodiversity Conservation	FOR-505	3(2+1)
Minor	Seed Collection, Storage & Testing	FOR PT 521	3(2+1)
	Modern Nursery Technology	FOR PT 522	2(1+1)
Supporting	General Statistical Methods & Research Methodology	FOR-513	2(1+1)
Compulsory NC	Library Information Services	PGS 501	1 (0+1)
	Intellectual Property Rights and its management in agriculture	PGS 503	1 (1+0)
	Basic concepts in Laboratory Techniques	PGS 504	1 (0+1)
	Human Values & Professional Ethics	HVE	2(1+1)
Semester II			
Major	Forest Products- Chemistry & Industries	FOR-504	3(2+1)
	Forest Policy, Laws & International Conventions	FOR-508	2(2+0)
	Tree Improvement	FOR-509	2(1+1)
	Forest Protection	FOR-507	2(1+1)
Minor	Nutrient & Weed Management in Nursery & Plantation	FOR PT 523	3(2+1)
	Management of Insect-Pests & Diseases	FOR PT 524	2(1+1)
	Energy Plantation and Bio fuel	FOR PT525	2(1+1)
Supporting	Remote Sensing & Geographic Information System	FOR-512	2(1+1)
	Computer Application & Information Tech.	FOR-511	1(0+1)
Compulsory NC	Technical Writing and Communication Skill	PGS 502	1 (1+0)
	Agricultural Research Ethics and Rural Development Programme	PGS 505	1 (1+0)
	Disaster Management	PGS 506	1 (1+0)
Semester III			
	<i>Comprehensive examination</i>		
	Seminar	FOR-591	1(0+1)
	Thesis research	FOR-AF599	10 (0+10)
Semester IV			
	Thesis research	FOR-AF599	10 (0+10)

FOR 504 Forest Products – Chemistry And Industries 2+1

Objective

The course will equip the students regarding wood based industries. How it is affecting the economy of the country such as match and splint, sports and pencil making, besides this wood extracts resins and gums, katha, tannis and various type of non timber products. Practical will make them aware regarding extracting method of different products of wood.

Theory

UNIT I Importance of forest based industries in relation to Indian economy. Chemistry in relation to forest products.

UNIT II Description of different forest based industries - paper and pulp, furniture, bamboo, sports goods, pencil making, match box and splint making, use of wood of lesser known forest species for commercial purposes.

UNIT III Cell wall constituents. Chemistry of cellulose, starch, hemicelluloses and lignin. Extraneous components of wood – water and organic solvent soluble.

UNIT IV Chemical composition of oleoresin from major pine species. Structural difference among different gums (arabic, ghatti, tragacanth).

UNIT V Chemical nature and uses of volatile oils, tannins, katha and cutch. Chemical nature and uses of important forest based dyes and pigments.

Practical

- Estimation of cell wall contents – Hemicellulose and lignin, Extraction of essential oils, resins, tannins, Acetylation of wood, Visit to nearby forest based industries.

Suggested Readings

Anonymous. 1981. Wealth of India. CSIR.

Anonymous. 2007. Year Book of Forest Products. FAO.

Dwivedi AP. 1993. Forestry in India. Surya Publ.

Mehta T. 1981. A Handbook of Forest Utilization. Periodical Expert Book Agency.

Krishnamurthy – Minor Forest Products of India Oxford & IBH

FOR 505 Forest Ecology and Biodiversity Conservation 2+1

Objective

To develop understanding of students about ecological aspects of forest, conservation of forest resources & biodiversity, consequences of depleting biodiversity and sustainable use of biodiversity.

Theory

UNIT I Advanced topics in forest ecology including forest population, forest community dynamics, forest community structure and analysis, forest productivity on a global scale, ecology of forest landscapes spatial heterogeneity; Hierarchy issues in ecology.

UNIT II Conservation of natural resources (hotspot areas, wildlife sanctuaries, national parks, biosphere reserve). Global warming and forests. Green House Effect and its consequences. Ozone depletion. Conservations laws and acts. Forest genetics resources of India timber and non timber species. Survey exploration and sampling strategies.

UNIT III Documentation and evaluation of forests genetical resources (FGR), *in situ* and *ex situ* conservation of gene resources. Biological diversity and its significance to sustainable use. Handling and storage of FGR. Intellectual property rights. Quarantine laws and FGR exchange.

Practical

- Study of forest community structure and its successional status, Estimation of productivity of forest ecosystem, Trip to different regions of the state to study forest vegetation, Collection and preservation of specimen, Methods of vegetation analysis, Measurement of biomass and productivity, Quantification of litter production and decomposition, Visit to national parks, wildlife sanctuaries, botanical gardens and arboreta.

Suggested Readings

- Anonymous 2006. Report of the National Forest Commission. Govt. of India.
Dhyani SN. 1994. Wildlife Management. Rawat Publ. 19
Huxley P. 1999. Tropical Agroforestry. Blackwell.
Khan TI & Al-Azmi DN. 1999. Global Biodiversity Conservation Measures. Pointer Publ.
Kimmins JP. 1976. Forest Ecology. MacMillan.
Nautiyal S & KoulAK. 1999. Forest Biodiversity and its Conservation Practices in India. Oriental Enterprise.
Ramakrishnan PS. 1992. Shifting Agriculture and Sustainable Development. Man and Biosphere Series. The Parthenon Publ. Group.

Objective

To develop understanding of students about forest resource management and economics management decisions, natural and environmental resource accounting.

Theory

UNIT I Application of microeconomics in solving forest resource problems. Emphasis on forest products demand and supply analysis, forest products marketing, forest capital theory.

UNIT II Inter-regional and international trade in forest products. Impact of economics and physical variables upon forest appraisal and management decisions. Externalities and property rights.

UNIT III Natural and environmental resource accounting –methods and implications. Application of operations research tools in evaluating forest management alternatives in public and private forest planning.

Practical

- Exercises on estimation of demand and supply functions; biodiversity valuation, valuation of non-marketed forest products. Exercises on financial and economic appraisal of forestry projects. Exercises on marketing of forest products and international trade competitiveness. Computer applications for using programming techniques in evaluating forest management alternatives.

Suggested Readings

FAO 1986. Guidelines to Practical Project Appraisal. Natraj Publ.

Kerr JM, Marothia DK, Singh K, Ramaswamy C & Beritley WR. 1997. Natural Resource Economics Theory and Applications in India. Oxford & IBH.

Nautiyal JC. 1988. Forest Economics – Principles and Applications. Natraj Publications, Dehradun.

Sharma LC. 1980. Forest Economics, Planning and Management. International Book Distributors, Dehradun.

FOR 508 Forest Policy and Laws and International Conventions 2+0

Objective

To develop understanding of students about forest policy and laws and international conventions

Theory

UNIT I Forest policy – Relevance and scope; National Forest Policy – 1894, 1952 and 1988;

UNIT II General principles of criminal law; Indian Penal Code, criminal procedure code; Indian evidence act applied to forestry matters.

UNIT III Forest laws; Indian Forest Act –1927, general provision and detailed study; Forest Conservation Act 1980, Wildlife Protection Act 1972 Important Forest Rules and Guidelines.

UNIT IV Important case studies and landmark judgments.

Suggested Readings

Indian Forest Acts (with short notes)1975. Allahabad Law Agency.
Jha LK. 1994. Analysis and Appraisal of India's Forest Policy. Ashish Publ. House.
National Forest Policy 1952. Ministry of Food and Agriculture, New Delhi.
National Forest Policy 1988. Ministry of Environment and Forests, New Delhi.
Negi SS. 1985. Forest Law. Natraj Publ.
Saharia VB. 1989. Wildlife Law in India. Natraj Publ.

FOR 510

Forest and People

2+0

Objective

It will help students to understand socio-economic, cultural and ecological relationship between forests and people. It will acquaint students with the role of people in forest management through analysis of need dependence and traditional interactions between forests and society.

Theory

UNIT I

Forests and its importance, forest societies, interactions between forests and people, importance of forests in traditional farming systems, livestock economy and forests, social and cultural factors of forest management, man in ecosystem in relation to eco-philosophy.

UNIT II

Afforestation programmes and forest conflicts, wildlife and human conflicts, important forest movements like Chipko Movement, Gender dimension of forest management, tribal economy and forests. Pastoralists and their dependence on forests. Forests and economic security of tribal.

UNIT III

Management of Commons and Common Property Resources (CPRs) and open access resources, forest management and sustainable livelihood strategies, forests and food security, eco-tourism and local development, land use change and forestry.

UNIT IV

Forest rights, customary rights of people, community participation, biodiversity and ethno-botany, Joint Forest Management, global environmental change and land use; dams, forests and resettlement of tribal and non-tribal – case study, poverty alleviation and forests, tourism and forest management, role of NGOs and other CBOs community based organization in forest management.

Suggested readings

Annamalai R. 1999. Participatory Learning Action and Microplanning for JFM. Dean SFRC, Coimbatore.

FAO. 1978. Forestry for Local Community Development. FAO Publ.

Shah SA. 1988. Forestry for People. ICAR.

Tiwari KM. 1988. Social Forestry and Rural Development. International Book Distr.

Vyas GPD. 1999. Community Forestry. Agrobios.

FOR-PT 521 Seed Collection, Storage and Testing 2+1

Objective

To impart knowledge and develop understand about seed development in tropical, sub-tropical and temperate region, testing & certification.

Theory

UNIT I Introduction, trends and development in tropical, sub-tropical and temperate forestry and their influence on seed demand. Seed problems limiting actors in tree propagation and afforestation.

UNIT II Flowering and seed production in gymnosperms and angiosperms. Development and maturation of seed/ fruit.

UNIT III Modes of seed dispersal. Determining optimal harvest maturity indices. Factors influencing choice of collection methods. Methods of seed collection and processing, stage methods and seed testing techniques.

UNIT IV Seed certification.

UNIT V Eco-physiological role of seed storage. Classification of seed storage potential. Factors affecting seed longevity. Pre-storage treatment. Physiological change during ageing. Viability and vigor. Storage of orthodox, recalcitrant and pre-storage intermediate seeds, Fumigation and seed treatment.

Practical

- Identification of forest seeds. Seed sampling, different storage methods, Seed quality testing-purity, viability and germination, collection and processing of seeds/ fruit. Tests of viability viz., cutting, hydrogen peroxide, excised tetrazolium, embryo, seed health testing primarily to the presence or absence of disease-caused organisms such as fungi, bacteria, virus and animal pests, Recording, calculation and use of results of seed treatment.

Suggested Readings

Khullar P 2003. Forest Seed. ICFRE Publication, Dehradun.

Lars Schmidt. 2000. Guide to Handling of Tropical and Subtropical Forest Seeds. Danida Forest Seed Center, Denmark.

Singh V. 2003. Forestry Seed and Nursery Management. Bishen Singh & Mahendra Pal Singh, Dehradun.

Willan RL. 1985. A Guide to Forest Seed Handling. FAO.

FOR-PT 522 Modern Nursery Technology 1+1

Objective

To impart knowledge on modern nursery techniques about types of nursery, vegetative propagation, use of green house, mist chamber and fertilizer use.

Theory

UNIT I Introduction and importance of nursery. Types of nurseries. Bare root, containerized and vegetatively produced nursery.

UNIT II Bare root nursery- nursery soil and water management, bed preparation, pre sowing seed treatments, seed sowing and intermediate operations viz., pricking, watering, fertilization, weeding and hoeing. Physiology and nursery environment interaction affecting seedling growth. Root culturing techniques. Lifting windows, grading, packaging and storing and outplanting.

UNIT III Containerized nursery - Type and size of container including root trainers, selection of growing medium.

UNIT IV Types of green house and mist chamber for propagation. Vegetative propagation - importance, selection of superior phenotype, methods of propagation viz. cutting, budding, grafting and layering. Factors affecting rooting of cuttings.

UNIT V Structures, media fertilizers, sanitation and containers, source selection and management in vegetative propagation.

Practical

- Introduction and identification of modern equipments and tools used in nursery. Pre-sowing seed treatments. Preparation of nursery beds and growing media for containerized nursery. Sowing of seed and other intermediate nursery management operations. Preparation and planting of cuttings. Use of vegetative propagation methods such as budding, grafting and layering. Precaution required in vegetative propagation, use of plant bio-regulators for rooting. Maintenance of nursery records. Identification of nursery insects and disease and their control measures. Visit to nurseries.

Suggested Readings

Chaturvedi AN. 1994. Technology of Forest Nurseries. Khanna Bandhu.

Dwivedi AP. 1993. Forestry in India. Suya Publ.

Kumar V. 1999. Nursery and Plantation Practices in Forestry. Scientific Publ.

Ram Prakash, Chaudhari DC & Negi SS. 1998. Plantation and Nursery Techniques of Forest Trees. International Book Distributors.

FOR-PT 523 Nutrient and Weed Management in Nursery and Plantation 2+1

Objective

To disseminate knowledge about managing nurseries and plantations under optimal conditions.

Theory

UNIT I History of nutrient management in forest nurseries and plantation. Essential nutrient elements and their deficiency. Mechanism of nutrient uptake by plants, functions and translocation/ Interactions. Concept of nutrient availability.

UNIT II Climatic and soil conditions causing micronutrient deficiencies in plants. Occurrence and treatment of micronutrient disorders. Evaluation of soil for the supply of micronutrient. Rare and non-essential elements. Technology and use of complex liquid and suspension fertilizers. Fertilizer use efficiency factors.

UNIT III Biological nitrogen fixation and bio-fertilizers. Farm yard manure and other organic fertilizers.

UNIT IV Mycorrhizal associations and their significance. Economic implications of nutrient management. Importance of renewable waste and their recycling.

UNIT V Principles of weed control. Methods of weed control-cultural, biological, mechanical and chemical. Herbicide/ weed side classification, properties and their application.

Practical

- Principles and methods of soil and plant analysis. Preparation of nutrient solutions. Practical application of fertilizers. Study of fertilizer response and diagnosis of deficiency symptoms. Fertilizer testing and pot experiments. Nursery inoculation techniques of bio-fertilizers. Methods of application of formulated products-seed treatment, root dip, suckers treatment, soil application, foliar application and combination of different methods.

Suggested Readings

- Allen V & Barker 2007. Handbook of Plant Nutrition. Pilbeam London.
Chaturvedi AN. 1994. Technology of Forest Nurseries. Khanna Bandhu.
Evans J. 1982. Plantation Forestry in the Tropics. Clarendon Press, Oxford.
Kumar V. 1999. Nursery and Plantation Practices in Forestry. Scientific Publ.
Luna RK. 1989. Plantation Forestry in India. International Book Distributors.
Singh O & Negi M. 1993. Bibliography on Biomass and Nutrient Cycling of Forest Species. FRI Dehradun.

FOR-PT 524 Management of Insect-Pests and Diseases 1+1

Objective

To impart knowledge about maintaining plantations and forests under disease free conditions.

Theory

UNIT I Principles and methods of integrated pests management – physical, cultural, chemical and biological methods. Use of attractants and repellants. Male sterility techniques.

UNIT II Diseases of forest nurseries and plantations. Abiotic agents of tree diseases and their relationship with hosts. Methods of disease control – exclusion, cultural, biological and chemical.

UNIT III Rodents, Birds, squirrels, herbivores. Forest plant quarantine.

Practical

- Collection and identification of insects and non-insects. Inspection and collection of damaged material showing insect damage. Identification and use of plant protection equipments. Preparation of different concentrations of pesticides and Identification of important diseases in forest nurseries and plantations. Preparation of fungicidal concentrations and their use in controlling nursery and plantation

Suggested Readings

Evane JW. 1989. Insect Pest and their Control. Samir Book Center, Delhi.
Phillip DM. 1982. Diseases of Forest and Ornamental Trees. MacMilan.
Speight MR. 2000. Insect Pest in Tropical Forestry. RoseWilley Publ..

FOR-PT 525 Energy Plantations and Bio-Fuels 1+1

Objective

To develop understanding about the scope and advantages of using and raising bio-energy plantations.

Theory

UNIT I Introduction and advantages of energy plantations. Energy and biomass consumption patterns in India. Environmental impacts of biomass energy.

UNIT II Assessment of bio-energy programmes in India. Power generation from energy plantation, producer gas. High Density Energy Plantations (HDEP). Land and biomass availability for sustainable bio energy. Impact of energy efficiency in power sector.

UNIT III Need for research and development on environment friendly and socio economical relevant technologies. Energy from plants-problems and prospects. Petro-crops. Criteria for evaluation of different species for energy plantation.

UNIT IV Recent energy technologies in the product of bio-fuels.

Practical

- Identification of important fuel woods and petro-crops. Study on different bio fuels used in India. Determination of calorific value, moisture and ash content in biomass Study of energy consumption pattern in rural and urban areas through survey. Visit to nearby Bio-energy units.

Suggested Readings

Chaturvedi AN. 1994. Technology of Forest Nurseries. Khanna Bandhu.
Kumar V. 1999. Nursery and Plantation Practice in Forestry. Scientific Publ.
Luna RK. 1989. Plantation Forestry in India. International Book Distributors.

FOR 511 Computer Application and Information Technology 0+1

Objective

To develop understanding about Computer based modeling, data base management and networking.

Practical

- Working with MS-DOS. Database design. Data entry operation. Word processing MS Office. Database management programme. Use of electronic spread sheet and graphics. Use of SPSS statistical application packages. Working with MS-DOS. Database design. Data entry operation. Word processing MS Office. Database management programme. Use of electronic spread sheet and graphics. Use of SPSS statistical application packages. Features of Information Technology Introduction to Information Technology – Basis of computer networking - LAN, WAN – BUS Tokening- star-internet, intranet – Basics of E-mail – Exposure to web browsing(structure of URL), Types of web sites – internet service provider – using internet news – scope of IT in forestry

Suggested Readings

Balaguruswamy E. 1998. Programming with ANSI C. Tata McGraw Hill.
Gottfried B. 1999. Programming with C. Schaum Outline Series. Tata McGraw Hill.
IASRI 1999. Introduction to MS Office 97 and SPSS. IASRI Publ.
Malvino AP & Brown JA. 1999. Digital Computer Electronics. Tata McGraw Hill.
Mano MM. 1999. Digital Logic and Computer Design. Prentice Hall of India.
Tanenbaum AS. 2003. Computer Networks. Prentice Hall of India.

FOR 512 Remote Sensing and Geographic Information System 1+1

Objective

To acquaint with the use of imageries, GIS and simulation in forest survey and management.

Theory

UNIT I

The use of aerial photography, satellite imagery and geographic information system for the collection, storage and spatial analysis for georeferenced forest resources data and information.

UNIT II

The integration of spatial data analysis systems with knowledge-based systems and/or simulation systems for the development of information/decision support systems for forest management; satellite systems; satellite imageries – techniques, uses and limitation;

UNIT III

Future prospects of remote sensing in India; softwares used in remote sensing ; GIS versus remote sensing; GIS Software used in forestry and environments; Analysis of data; Application of GIS in forestry.

Practical

- Uses of various photogrammetry instruments, recognition and identification of objects on photography, compilation of maps and their interpretation, Hands on practice on remote sensing and GIS, software.

Suggested Readings

Burrough PA. 1990. Principles of GIS for Land Resources Assessment. Oxford & IBH.

Lillsand TM. 1989. Remote Sensing and Image Interpretation. John Wiley.

Narayanan LRA. 1999. Remote Sensing and its Application. Universities Press (India) /Orient Longman.

Sharma NK. 1986. Remote Sensing and Forest Survey. International Book Distr.

FOR 513 General Statistical Methods & Research Methodology 1+1

Objective

To provide exposure about methods of statistical analysis, designs and sampling techniques.

Theory

UNIT I Introductory Statistics scales of measurement, concept of graphical, exploratory and inferential data analysis, important variables of forestry sector

UNIT II Probability and probability distributions Review of probability theory, concept of random variable and expectation, probability distributions (Binomial, Poisson, Normal, Weibull)

UNIT III Correlation and regression Simple, Rank, Partial, Multiple, Infraclass correlations, Furnivall Index and coefficient of determination. Linear and nonlinear regressions, parabolic, exponential, power and logarithmic functions

UNIT IV Estimation and Testing of Hypotheses, Concept of point and interval estimation, estimators and estimates, properties of good estimators – unbiasedness and minimum variance, tests of significance – t, F, z, and χ^2 , testing significance of correlation and regression coefficients, analysis of variance (ANOVA) – one way and two way classification with single and more than one cell frequency.

UNIT V Design of Experiments. Principles of experimental designs, Completely Randomized Design (CRD), Randomized Block Design (RBD), Latin Square Design (LSD), Row- Column (alpha) designs, Split Plot and Strip Plot Designs.

UNIT VI Sampling – Theory and applications Why sample? Simple Random Sampling (with and without replacement), Stratified Random Sampling, Double sampling, Multistage sampling, Cluster sampling

UNIT VII Multivariate statistical techniques Multivariate Analysis of Variance, Principal Component Analysis, Factor Analysis, Cluster Analysis.

Practical

- Fitting of probability distributions, Computation of correlations and regressions, Tests of significance – t, F, z and χ^2 , Exposure to statistical packages SPSS and GENSTAT for ANOVA, multivariate analysis Laying out of designs in the field (i) Fan design, (ii) Latin Square, (iii) Randomized block design, (iv) Split plot design, (v) Row-Column designs and (vi) Scattered block. Data analysis of the above designs.

Suggested Readings

Dear KBG, Mead R & Relay J. 1987. Statistical Tools for Agro-Forestry Research – Bivariate Analysis for Intercropping Experiments. ICRAF, Nairobi.
Matin J. 1976. Principles of Database Management. Prentice Hall.
Pase UG & Sukhatme MU. 1978. Statistical Methods for Agricultural Workers. ICAR.
Surendran C, Sehgal RN & Paramathma M. 2003. Text Book of Forest Tree Breeding. ICAR.

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 Organisations. Critical evaluation of rural development policies and programmes. Constraints in implementation of rural policies and programmes.

Suggested Readings

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

PGS 506 Disaster Management 1(1+0)

Objective To introduce learners to the key concepts and practices of natural disaster management; to equip them to conduct thorough assessment of hazards, and risks vulnerability; and capacity building.

Theory

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

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

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

Objective

To equip the students/scholars with skills to write dissertations, research papers, etc. To equip the students/scholars with skills to communicate and articulate in English (verbal as well as writing).

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

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

PGS 503 Intellectual Property and Its management in Agriculture 1(1+0)

Objective

The main objective of this course is to equip students and stakeholders with knowledge of intellectual property rights (IPR) related protection systems, their significance and use of IPR as a tool for wealth and value creation in a knowledge-based economy.

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 Readings

Erbisch FH & Maredia K.1998. Intellectual Property Rights in Agricultural Biotechnology. CABI. Ganguli P. 2001. Intellectual Property Rights Unleashing Knowledge Economy. McGraw-Hill. Intellectual Property Rights Key to New Wealth Generation. 2001. NRDC & Aesthetic Technologies. Ministry of Agriculture, Government of India. 2004. State of Indian Farmer. Vol. V. Technology Generation and IPR Issues. Academic Foundation. Rothschild M & Scott N. (Ed.). 2003. Intellectual Property Rights in Animal Breeding and Genetics. CABI. Saha R. (Ed.). 2006. Intellectual Property Rights in NAM and Other Developing Countries A Compendium on Law and Policies. Daya Publ. House. The Indian Acts - Patents Act, 1970 and amendments; Design Act, 2000; Trademarks Act, 1999; The Copyright Act, 1957 and amendments; Layout Design Act, 2000; PPV and FR Act 2001, and Rules 2003; National Biological Diversity Act, 2003.