DEPARTMENT OF FORESTRY, WILDLIFE & ENVIRONMENTAL SCIENCES

GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR-495009, CHHATTISGARH

SYLLABUS FOR VISHWAVIDYALAY RESEARCH ENTRANCE TEST (VRET) IN FORESTRY

Section I - Research Methodology

Unit 1- Fundamentals of Research

Aims and objectives of research, Types of research- basic, novel and applied research. Tools for searching research topic – books, journals, internet, discussions etc. Research hypothesis, Steps in research design. Problems encountered by researchers. Review of literature, concept of bibliography and reference, software of literature search, types of report.

Unit 2- Research Aptitude

Qualities of a researcher, Logical reasoning, Test for intelligence, Basic mathematics. Ethics in research- plagiarism Need for Research Design, Features of a Good Design, Important Concepts relating to Research Design, Different research Design, Basic Principles of Experimental Design; Randomized block, Complete randomized block, Latin square and split plot designs. Sampling Design, Implications of a Sample Design, Criteria of selecting a sampling procedure, Different Types of sample Designs.

Unit 3- Data Collection, Processing and Analysis

Types of Data, Various methods of data collection- Observation, Schedule and Questionnaires, Survey, Case study, Data sources, Measurement, scaling and surveying techniques. Processing and analysis of data. Determination of the sample size, sampling and non-sampling tests.

Unit 4- Hypothesis

Introduction to Hypothesis, Procedure for Hypothesis testing, Parametric and nonparametric Hypothesis test, testing of Hypothesis using various tests like Analysis of Variance and Covariance (ANOVA and ANOCOVA), Chi square test, Multivariate analysis.

Unit 5- Interpretation and Report writing

Scientific communication- Basics of communication skills, Writing- research reports, research papers, research proposals and review articles. Importance of research proposal and research papers. Methods of research presentations. Communication with editors. Handling referee's comments, Galley proof. Citation & Acknowledgements.

Section- II

Unit - 1

Forest structure and their components, Forest ecosystem concept, Stand dynamics-forest succession, competition and tolerance, classification of world's forest vegetation. Forest types and their distribution. Ecophysiology of tree growth, effects of radiation and water relationship, mineral nutrient and temperature.

Definition and importance of forest soils, Origin, classification and nomenclature of soils; Soil profile; Soils of major forest biomes; Difference between forest soil and other arable soils; Important physical, chemical, and biological properties of forest soils; Forest soil survey; land use type and forest plantations; Forest-soil types, Silviculture practices and forest soils. Organic matter content, litter decomposition and C:N ratio in forest soil; Forest soil fertility, nutrient management and biological nitrogen fixation; Management of forest nursery soil. Soil degradation-problems and impact on forest ecosystems; Forest fire and soil resilience, Forest soil pollution, Characteristics, ecology and management of tropical forest soils. Problems and prospects in management of tropical dry and moist deciduous forest soils.

Forest genetic resources of India. Survey exploration and sampling strategies. Documentation and evaluation of forests genetic resources (FGR), *in situ* and *ex situ* conservation of genetic resources. Biological diversity and its significance to sustainable use. Handling and storage of FGR. Intellectual property rights. Quarantine laws and FGR exchange. Genetic constitution of tree populations, Hardy-Weinberg equilibrium, changes in gene frequency through selection, migration, mutation and population sizes. Marker assisted selection.

Genome: Nuclear Genome, Mitochondria Genome, Chloroplast Genome and Evolution of the tree Genomes. Transcription and translation of forest tree Genes. DNA replication. Genetic code. Gene expression. Regulation of Gene Expression. DNA damage, repair and recombination.
Genetic diversity/Genetic variation of forest trees: causes and advantages. Genetic characterization of forest tree species. Morphological, Biochemical and Genetic markers. Molecular markers: Dominant and codominant, Types of molecular markers: advantages and disadvantages. Techniques in molecular genetics of forest trees: DNA isolation, DNA

quantification, DNA restriction; Primer ,gel electrophoresis; southern, northern and western blotting; nucleic acid hybridization; polymerase chain reaction, gene sequencing.
Polymorphism and its significance. Calculation of genetic diversity within and between forest tree populations. Molecular markers and genome mapping. Application of molecular markers in forest tree improvement

General concept of forest tree breeding, tree improvement and forest genetics. Reproduction in forest trees, dimorphism pollination mechanisms. Pollen dispersion distances, pollinators and their energetics. Breeding methods for wood quality, agroforestry, diseases and pest resistance, drought and salt tolerance.

Unit- 2

Definition and scope of forest management. Peculiarities of forest management. Principles of forest management and their applications. Objects of management, purpose and policy. Development of forest management in India. Sustainable Forest Management.

Forest inventory, sampling methods adopted in forestry. Different methods of surveying. Chain survey, compass survey and plane table survey, Maps and map reading. Basic principles of Forest Engineering, forest road and bridge.
Silviculture system, Definition and types, Bioclimate and microclimate effect. Natural regeneration. Artificial regeneration. Intensive studies pertaining to important commercial species. Advanced and modern nursery tools &techniques. Regeneration survey, mycorrhiza, biofertilizers and biopesticides.

Forest protection; Forest Fire, Wildlife damage in nurseries, plantations and their management. Weed problems in nurseries, plantations and their control. Adverse climatic factors, acid rains and air pollutants in relation to forest tree health. Disease concept and disease cycle. Biodegradation of wood. Biological control of insect pests and diseases of forest trees. Nature of disease resistance. Molecular tools for developing disease resistance trees. Forest biometry, measurement of diameter, tree height, tree volume, form factor, increment, biomass, stem analysis, stump analysis, forest yield.

Dependency of villagers, tribal on forest resources for different livelihood options. Nature, scope and importance of forest resources in regional & national economy, nature, role and

functions of forest based industries, reasons for resource degradation.

National Forest Policy – 1894, 1952 and 1988, Indian Forest Act -1927, Forest Conservation Act 1980, Wildlife Protect Act 1972, Forest Right Acts, 2006.

Unit - 3

Historical development of ecology as a science. Concept of levels of biological organization. Ecosystem, classification and distribution. Major abiotic and biotic components and their interaction, Nutrient cycling, trophic levels, food webs, ecological pyramids and energy flow. Population ecology - definition, population dynamics and carrying capacity, preparation of life table and its importance in forest management. Community ecology – Species interaction, Ecological succession. Biodiversity, types, importance, threats and its conservation.

Environment, Definitions and concepts of environment components of atmosphere, hydrosphere, biosphere and their interactions. Biogeochemical cycle of greenhouse gases, source and sinks.

Development of green belt, energy plantation, agroforestry, windbreak, shelterbelt, canopy management, carbon sequestration.

Environment Pollution, Types of pollutions, methods of measurement of pollution, classification of pollutants, national and international Environmental standards of important pollutants.Air pollution: Major pollutants and their sources. Vehicular pollution. Water Pollution: Important pollutants source, impact of heavy metals, halogen and radio nuclides on forest and soil. Treatment technologies for industrial effluents/wastewater. Monitoring water pollution and water quality standards. Soil pollution: Heavy metal toxicity in soil, Impact of pesticides, industrial waste and fertilizers on soil physicochemical properties. Microbiological degradation of xenobiotic in environment. Climate changes: Earth's climate systems, adaptability and vulnerability. A global perspective of climate change, global warming, greenhouse gases, IPCC initiatives in climate change mitigation, various mitigation mechanism- Kyoto protocol-strategies. Impact of climate changes on Indian forest, adaptation of forest trees to climate change, case studies on the management of certain tree species in India. Global Environmental Problems: acid rain, Eutrophication, Bio manipulation, Ozone depletion and UV radiation. Bioremediation of contaminated soils and waste lands.

Introduction to environmental impact assessment, impact assessment methodology, environmental planning. Environmental policy and legislation in India.

Causes of environmental degradation- socio-economic factors. Human population growth and life style. Sustainable development.

Unit - 4

Definitions, Values, Zoological classification, Sign and symptoms. Animals behavior & adaptations, Wild life Ecology, Basic concepts, Wildlife habits and habitat. Wildlife Ecology: Wildlife habitat and component Wildlife conservation: Definition, Concept, significance. Wildlife conservation movement, Wildlife conservation in India, In-situ and Ex-situ wildlife conservation, Role of protected area in wildlife conservation, some rare and threatened wildlife species of world particularly India, special project for endangered species, Project tiger, Gir Lion Project, Crocodile Breeding Project, Wildlife Conservation organization- National and International. Wildlife management: Wild life management its scope as a natural resource, current status of wildlife management. Management of certain animals: small game management water fowl, Pigeon, aquatic animal. Reptile, Big game management, Tiger, Bear, Elephant, Rhinoceros, deer.

Biological basis of management- animal population, shelter, food, WL Policy Legislation and administration policies and programmes, Wild life protection act 1972, wild life education, Age and Sex determination, Tiger census, Preservation of biological material, National Park and Sanctuaries of (C.G). Wildlife management techniques. Wildlife corridors. MAB, Red Data Book, Category of threat, CITES. Agencies involved in wildlife conservation, Govt. and NGO's. BNHS, WWF, Indian Board for Wildlife, CITES. Wildlife damage control: Mitigating human – wildlife conflict: fences, trenches, walls, lure crops, repellents, translocation and compensation. Captive wildlife : Zoos and safari parks. Captive breeding for conservation. Central Zoo Authority of India. Wildlife census, Purpose, techniques. Direct and indirect methods of population estimation. Sample and total counts, indices, encounter rates and densities. Wildlife (Protection) Act, 1972. Protected areas –Sanctuary, National Park and Biosphere Reserves. Special projects for wildlife conservation. Introduction and reintroduction of species.

Unit – 5

Wood as a raw material, kinds of wood: hard wood, soft wood, bamboos and canes. Merit and demerits of wood as a raw material. The physical features of wood. Wood seasoning, principles

and types- air seasoning, kiln seasoning & chemical seasoning. Refractory classes of timber, kiln schedule. Seasoning defects and their controls. Wood preservation- needs, principles, process, types of wood preservatives (water soluble, oil based, etc). Wood working, gum resin, tannin fiber and flossus, tendupatta and other Non-wood forest products.

Important medicinal and aromatic plants. Medicinal Plants: ashwagandha, sarpgandha, satavar, amla, harra, baheda, aloe vera, giloy, kalmegh, safed musli, kali musli, Pepper, *Dioscorea*, Isabgol, Belladonna, *Cinchona* and other species relevant to local conditions. Aromatic Plants : Citronella grass, Khus grass, Sweet flag (bach), *Mentha*, Musk mallow, *Ocimum* and other species relevant to the local conditions. Study of active constituents of a few important medicinal and aromatic plants, their extraction and use. Endangered medicinal and aromatic plants of India and their conservation. Value addition process of medicinal plants.

Importance of forest based industries in relation to Indian economy. 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.