

11. Forest Product Utilization Syllabus for conducting written Examination for direct Recruitment of Teaching posts in the Cadre of Assistant professors at UASM

NON WOOD FOREST PRODUCTS MANAGEMENT

Classification of non wood forest products like gums and resins, katha, dyes, tannins, oils, raw drugs, bamboos, canes and other products.

Technologies for extraction of gums, resins, katha, dyes, tannins, oils, raw drugs and other products.

Utilization of various non wood forest products and their scientific management for processing, value addition, marketing and disposal.

Quality assessment of important products and their methods for storage. Important industries based on non wood forest products and their management.

APPLIED WOOD TECHNOLOGY

Physical properties of wood-wood density, specific gravity and methods of their determination. Effect of growth on density of wood. Moisture content and its measurement. Effect of sound on wood resonance. Color of wood, phosphorescence, fluorescence and residual luminescence. Thermal properties-conductivity and diffusivity. Electrical properties-conductivity, dielectric constant and current resistivity. Wood permeability.

Mechanical properties-elastic constants, plasticity, Hook's Law, Poisson's ratio, elastic constants, modulus of elasticity, factors affecting strength properties, elastic theory of bending, shear stresses in simple beams, supported beams and cantilevers carrying concentrated and uniformly distributed loads, direct and bending safe working stresses and their evaluation.

Standard tests of timber specimen's-compression, tensile strength. Mechanics and Rheology of wood, abrasion, brittleness and hardness. Suitability coefficient and indices of different wood species. Vibration properties.

Effect of environment on mechanical properties of wood. Effect of radiations on strength of wood.

PULP AND PAPER TECHNOLOGY

Raw material used in pulp and paper industries, characteristics and handling.

Pulping process, mechanical, chemical, semi-chemical and biopulping. Pulp bleaching, pulp treatment, defibering, de-knotting, brown stock washing, screening, cleaning, thickening, etc.

Recycled fibers, supplementary pulp treatment and additives. Paper making, paper drying, reeling, external sizing, coating, calendaring, etc.

Structure of paper, its characterization and measuring strength method, optional and structural properties of paper, Type of paper: coated paper, corrugated containers, printing quality of paper, ageing of paper. Rayon industry.

COMPOSITE WOOD TECHNOLOGY

Introduction to wood modification, its need and scope. Chemical modification of wood (acetylation, reaction with isocyanates, acetates, ethers, epoxides, etc.) Wood impregnation and compregnation, heat stabilization, wood densification.

Modern trends in composite wood. Wood adhesives – types, characteristics and application.

Plywood, laminated wood and inorganic wood composites- their manufacture, characteristics and application.

AGRO-TECHNIQUES OF MEDICINAL AND AROMATIC CROPS

Importance of medicinal and aromatic plants in human health, national economy and related industries. Need of cultivation of medicinal and aromatic plants as agricultural crops. Concept of organic farming, GACP and GAP in medicinal and aromatic crops production. Quality concern in plant based drugs.

Introduction and importance, climate and soil requirements, cultural practices, harvesting and yield, important constituents of medicinal plants – *Mulhathi*, *Senna*, *Gloriosa superba*, *Valeriana jatamansi*, *Swertia chirayita*, *Isabgol*, *Rauwolfia serpentina*, *Withania somnifera*, Opium Poppy, *Aloe vera*, Satavar, *Stevia rebaudiana*, Safed Musli, Kalmegh and other important species of the region.

Introduction and importance, climate and soil requirements; cultural practices; harvest and yield; important constituents of aromatic plants – Citronella, Palmarosa, Mentha, Basil, Lemon grass, Rose, *Tagetes minuta*, Lavender, Rosemary, Patchouli, Geranium and other important species of the region.

BREEDING TECHNIQUES AND IMPROVEMENT OF MEDICINAL AND AROMATIC CROPS

Plant biodiversity, Major objectives of breeding of medicinal and aromatic crops. Plant introduction, domestication and germplasm conservation. Modes of pollination, male sterility, self incompatibility and apomixis. Production and maintenance of pure seeds of medicinal and aromatic plants.

Principles of plant breeding for self pollinated and cross pollinated crops. Selection, Hybridization-techniques and consequences. Heterosis and inbreeding depression. Different plant breeding methods for self pollinated, cross pollinated and asexually propagated crops. Mutation and polyploidy breeding. Distinctiveness, uniformity, stability testing in medicinal and aromatic crops.

Breeding for quality parameters in medicinal and aromatic crops. Achievements and prospects in breeding of important medicinal and aromatic crops- *Rauwolfia serpentina*, *Plantago ovata*, *Cassia angustifolia*, *Ocimum* spp., *Withania somnifera*, *Valeriana* spp., *Opium poppy*, *Gloriosa superba*, *Andrographis paniculata*, *Mentha* spp., *Geranium*, *Cymbopogon* spp., and other important crops.

Legislation in conservation of medicinal and aromatic plants- IPR issues in medicinal and aromatic plants.

CHEMISTRY AND PROCESSING OF MEDICINAL AND AROMATIC

Organic compounds and their classification such as aliphatic, aromatic, alkaloids, steroids, terpenoids, glycosides, phenolic compounds, heterocyclic compounds and carbohydrates.

Primary and Secondary plant metabolites and their therapeutic uses of phytoconstituents such as anthraquinones, steroidal and triterpenoidal glycosides, phenolic compounds, lipids, alkaloids and terpenoids.

Basic principles and extraction techniques of different phytoconstituents. Analysis of active principles using TLC, HPLC, Gas chromatography, etc. Quality standards in herbal products. Drug descriptors for medicinal and aromatic plants.

Postharvest processing-drying, grading and storage. Extraction techniques of essential oils and their quality analysis.

CHEMISTRY OF FOREST PRODUCTS AND INDUSTRIES:

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

Classification and description of different forest based industries – pulp and paper, composite wood, furniture, bamboo, sports goods, pencil making, match box and splint making. Use of lesser known wood species for commercial purposes.

Cell wall constituents. Chemistry of cellulose, starch, hemicelluloses and lignin. Extraneous components of wood – water and organic solvent soluble. Chemical composition of oleoresin from major pine species. Structural difference among different gums (arabic, ghatti, tragacanth, etc.).

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

WOOD CHEMISTRY

Chemical composition of wood: Cell wall constituents- cellulose, lignin, hemicellulose, peptic substances, etc.

Volatile oils and extractives, cellulose derivatives and their applications.

Hydrolysis and fermentation of lignocellulosic materials. Pyrolysis and gasification of wood.

WOOD PHYSICS

Wood density, thermal, electrical and acoustic properties of wood. Mechanics and Rheology of wood, elasticity, plasticity and creep (tensile compression and bending strength)

Toughness, torsion, shear, hardness and abrasion strength. Acoustic and acoustoultrasonics based non-destructive evaluation technique.

WOOD SEASONING AND PRESERVATION

Wood water relationship, absorption behaviour and wood drying, Refractory and non refractory behaviour of wood, Wood seasoning, types- air, kiln and special seasoning methods like steaming, chemical, high temperature drying, vacuum drying and water conditioning.

Defects of timber- natural, seasoning defects, defects due to external agencies, machining defects. Effect of defects on utilization.

Detection and diagnosis of discolouration and decay in wood: decaying agenciesfungi, insects, borer, etc.

Wood preservation: preservatives and treatment processes. Advantages and safety concern of wood preservatives, fire retardants. Graveyard test and anti-fungal activity of wood. Bio-preservation.

PRODUCTION OF MEDICINAL AND AROMATIC CROPS

Modes of reproduction in MAP crops and their relevance in maintaining genetic purity of crops. Concept of quality seed production and maintenance.

Soil fertility, essential nutrient elements- functions, deficiency symptoms, availability and factors affecting their availability. Soil micro-organisms and their role in organic matter decomposition. Importance of pH and C:N ratio in plant nutrition. Concept of bio-fertilizers and their potential for use in medicinal and aromatic crops.

Essentials of nursery production, criteria of site selection, and types of nursery, establishment of a model nursery. Nursery raising of medicinal plants. Tissue culture technique and *in-vitro* propagation of important MAPs.

Plant protection measures in medicinal and aromatic crops, Quality parameters of seedlings and nursery stock.

MEDICINAL AND AROMATIC PLANTS IN HEALTH CARE SYSTEMS

Concept of Health Care systems

Brief introduction to Ayurveda, Unani, Sidha, Homeopathy, Allopathy, Naturopathy, Electrohomoeopathy, etc.

Important medicinal plants used in treating various diseases in modern and complementary systems.

Biological activity of selected medicinal plants. Methods of preparing poultices, decoctions, powders, tinctures, active content rich extracts.

PHARMACOGNOSY OF MEDICINAL AND AROMATIC PLANTS

History and scope of pharmacognosy, Pharmaceutical products. Classification of natural drugs. Chemical nature of drugs. Pharmacognostic analysis of drug plants based on botanical, chemical and histological features.

Evaluation based on pharmacopoeial standards for both single drugs and compound formulations most commonly used in different systems of medicines.

Pharmacognostic features of Sarpagandha, Jatamansi, Ashwagandha, Turmeric, Punarnava, *Ephedra*, *Gymnema*, Senna, Amla, Gokhru, Isabgol, Black pepper, Banafsha, Arjun or any other commercially species specific to the region.