NRBMRI

(Syllabus)

Course Name: - Diploma in Bamboo Technology.

Duration: - 2 Years.

Semester 1

Paper 1

- Forest Ecology: - Relationship of forest ecology to other branches of ecology, Community diversity and complexity, Energy flux, Death and regeneration and Ecological potential of forestall species.
- Tree seed technology: - molecular mechanisms of seed and development of technologies for best exploitation of seed's potential, biological systems of seedlings.

- Principles of forest soil sciences: - Introduction to forest soil sciences, physical environment, soil formation, climate etc.
- Microbial communities: - Role of Microbial communities in the development of soil, microbial factors, microbial processes, decomposition and its effects on soil.
- Environmental studies: - All the necessary ecological factors contained in chemistry, geology and biology, different aspects of ecosystem and ecology.

Paper 2

- Basic Biology: - All the important biological factors necessary for the development of forest and farm culture such as the classification of organisms, their nomenclature etc.
- Basic Chemistry: - All the important aspects of Organic, Inorganic and physical chemistry required for cultivating the correct sense of application of chemicals and instruments used in the process of learning forestry and farm management.

- Basic Mathematics: - various topics which are essential for the systematic development and distribution of farms and forests such as statistics, probability and mensuration etc.
- Dendrology: - The systematic study of trees i.e. their types, classification, nomenclature, habit, habitat etc.

Paper 3

- Ecotourism: - Systematic methods of conducting tourism without disturbing the respective habitat or the surrounding environment. It is a form of tourism involving visiting fragile, pristine, and relatively undisturbed natural areas, intended as a low-impact and often small scale alternative to standard commercial mass tourism.
- Bioenergy: - Introduction, solid biomass, sewage biomass, electricity generation from biomass, systematic use and applications of bioenergy.

- Soil water management: - Introduction, understanding the concepts of soil water, available soil water, field capacity, wilting point, unavailable water, water holding capacity, minimum allowable balance, gravitational water, soil water potential etc.
- Environmental impact assessment: - The thorough study of assessment of environmental consequences of a plan, policy, program or actual projects prior to the decision to move forward with the proposed action

Paper 4

- Fruit production: - Introduction, methods of food fruit production using specialized techniques, brief idea of related concepts like thinning, alar, pomology, vineyard, orchard etc.

- Forest entomology: - introduction, definition, evaluation of present and potential insect pest problems related to forests, biological control, and development of suitable methods or procedures to reduce the economic loss caused by the pests.
- Silviculture of Indian trees: - Introduction, listing commercially important Indian trees, classification of high forest system, even aged forestry, un-even aged forestry, forest tree nurseries, regeneration, artificial regeneration etc.
- Forest policy legislation: - introduction, different policies related to Indian forests, legal aspects of farms and forest management etc.

SEMESTER 2

Paper 1

- Principles of Crop Production: - definition and scope of Agronomy, Classification of Crops on Different basis, General principles of Crop production : Climate, soil and its preparation, seed and seed sowing, post-sowing tillage, water management, nutrition, plant protection measures, harvesting, threshing and storage, Crop sequences and systems with emphasis on mixed cropping and inter cropping, etc.
- Fundamentals of Soil Science: - Definition of Soil, Components of Soil and their role in agriculture, Soil forming rocks and minerals, Development of Soil profile, Soil formation, factors affecting soil formation, soil forming processes, Soil reaction and its measurements and significance, Physical properties of soil, and

their significance, Chemical properties of soil, cation and anion exchange phenomenon and their importance in agriculture, etc.

- Agricultural Meteorology: - Different meteorological variables related to agriculture, Rainfall- Hydrologic cycle and its components, Types and forms of precipitation, Humidity, definition, wind vane, Anemo-meter, Indian Agro Climatic Zones Elementary idea of weather forecasting, etc.
- Introductory Plant Physiology: - Definition and importance of plant pathology, Causes of plant diseases, Classification of plant diseases according to cause and occurrence, Plant Pathogens, Different types of spores, Levels of parasitism, etc.

Paper 2

- General Microbiology: - Introduction, basic concepts of microbiology relevant to agriculture

and forestry, brief idea of lab techniques and methods as well as procedures used for the development of agricultural products using microbiology.

- General Biochemistry: - Introduction, basic concepts of biochemistry relevant to agriculture and forestry, brief idea of lab techniques and methods as well as procedures used for the development of agricultural products using biochemistry.
- Basic Biotechnology: - Introduction, basic concepts of biotechnology relevant to agriculture and forestry, brief idea of lab techniques and methods as well as procedures used for the development of agricultural products using biotechnology.

Paper 3

- Plant Tissue Culture: - Introduction, Basic Idea of Plant tissue culture, brief idea about seed

culture, embryo culture, callus culture, organ culture etc.

- Biophysical techniques: - Introduction, different applications of biophysical techniques to study the structure, properties, dynamics or functions of biomolecules at an atomic or molecular level.
- Plant Breeding- Definition and objective, Pure line selection, Hybridization (emasculation, bagging, crossing, labelling), Colonial selection, Heterosis (Definition and scope)
- Photoperiodism: physiology of flowering, photoperiodism and vernalization, role of florigen Senescence and abscission Seed dormancy: Causes and role, methods to break seed dormancy Plant defence: Definition: Hypersensitive response and Systemic acquired resistance; Role of secondary metabolites (Terpenes and phenolic compounds).

Paper 4

- Carbon Credit: - Introduction, Definitions, types, background, how buying carbon credits propose to reduce emissions, creating carbon credits, scope and applications of carbon crediting etc.
- Introduction to agricultural machinery: - basic information about the requirement and usage of different tools and equipment required for conducting agricultural activities.
- Introduction to forest machinery: - basic information about the requirement and usage of different tools and equipment required for conducting maintenance and developmental activities of forestry.
- Training about developing a market place: - Introduction, developing a perspective in students to analyze the beneficial aspects of agriculture and forestry.

SEMESTER 3

PAPER 1

- Systematics and taxonomy of Bamboo: - Introduction and detailed account of all the 115 genera as well as 1400 species of Bamboo, their differences, similarities and properties.
- Detailed account on the given tribes of bamboo: -Tribe Olyreae (herbaceous bamboos),Tribe Bambuseae (tropical woody bamboos), Tribe Arundinarieae (temperate woody bamboos).
- Distribution: - Distribution of bamboo in tropical and temperate regions. Area wise distribution of species of bamboo in Asia-Pacific regions.
- Ecology: - The two general patterns for the growth of bamboo i.e. "clumping", and "running". Clumping bamboo species tend to spread slowly, as the growth pattern of the rhizomes is to simply expand the root mass

gradually, similar to ornamental grasses. "Running" bamboos, though, need to be controlled during cultivation because of their potential for aggressive behavior.

- Mass flowering: - Bamboos seldom and unpredictably flower and the frequency of flowering varies greatly from species to species.
- Animal diet: -Brief idea of Soft bamboo shoots, stems and leaves which are the major food source of the giant panda of China, the red panda of Nepal, and the bamboo lemurs of Madagascar. Rats eat the fruits as described above. Mountain gorillas of Central Africa also feed on bamboo, and have been documented consuming bamboo sap which was fermented and alcoholic; chimpanzees and elephants of the region also eat the stalks. The larvae of the bamboo borer (the moth Omphisa fuscidentalis) of Laos, Myanmar, Thailand and Yunnan, China feed off the pulp of live bamboo. In turn, these caterpillars are considered a local delicacy.

Paper 2

- Cultivation: - Although a few species of bamboo are always in flower at any given time, growing a specific bamboo typically requires obtaining plants as divisions of already-growing plants, rather than waiting for seeds to be produced.
- Harvesting: - Introduction, detailed account on lifecycle of the culm, annual cycle, daily cycle etc.
- Leaching: -Introduction (Leaching is the removal of sap after harvest), steps involved in the entire process of Leaching.
- Maintenance of spreading runners: - Introduction, methods of maintaining the spread runners by observing the directions and locations of rhizomes.

Paper 3

- Culinary: - Introduction, types of culinary products obtained from different species of bamboo, their process of fermentation etc.
- Kitchenware: - The use of bamboo in the production of different utensils used in the kitchen, the process of manufacturing chopsticks from bamboo etc.
- Writing pen: - The brief idea of manufacturing writing pens made solely out of bamboo.
- Fabric: - Bamboo species *Phyllostachys edulis* is used extensively to produce fabric for clothing.

Paper 4

- Bamboo charcoal: - Introduction, the basic idea of production of bamboo charcoal by pyrolysis, its applications, health hazards related to it etc.

- Construction: - Introduction, the detailed mechanism of using different species of bamboo for different types of construction works.
- Biomass composition of bamboo: - The brief idea of the complete biomass composition of bamboo.
- Biofuel: - Introduction, the process of ectraction of ethanol from bamboo, different methods to obtain the bioethanol from bamboo.

SEMESTER 4

PAPER 1

- Basic Enzymology: - Introduction, basic idea of enzymes, nomenclature, specificity, concepts of co-enzymes, concept of multi enzyme complexes etc.

- Basic Molecular Biology: - DNA Replication: Prokaryotic and Eukaryotic DNA replication, mechanisms of DNA replication, fidelity of
- Replication, enzymes and accessory proteins involved in DNA replication.
- Gene mutations: Types of mutations. Suppression. Ames' test.
- DNA Repair: Direct repair, Ada protein, NER, BER, MMR, SOS repair, Transcription-repair coupling.

Paper 2

- Biofertilizers, Biopestisides and Integrated pest management: Bacterial biofertilizers, algal biofertilizers,
- Aquatic ferns as biofertilizers, Fungi as biofertilizers, earthworm as biofertilizers, biopestisides,
- Integrated pest management.

Paper 3

- Plant Biotechnology: - Shoot tip culture: rapid clonal propagation and production of virus free plants. Embryo culture and embryo rescue. Hybrid plants: protoplast isolation, culture and fusion, selection of hybrid cells and regeneration of hybrid plants, symmetric and asymmetric hybrid, cybrid. Production of haploid plants: anther, pollen and ovary cultures for production of haploid plants and homozygous lines.
- Plant metabolic engineering and industrial products: plant secondary metabolites, control mechanisms and manipulation of phenylpropanoid pathway, shikimate pathway, alkaloids, industrial enzymes, biodegradable plastics, polyhydroxybutyrate, therapeutic proteins, lysosomal enzymes, antibodies, edible vaccines, purification strategies, oleosin partitioning technology.

Paper 4

- Brief idea of latest developments in the field of bamboo technology.
- Brief idea of latest developments in the field of bamboo engineering.
- Brief idea of latest developments in the field of biotechnology.
- Brief idea of latest developments in the field of biofuel production.