THAKUR SEN NEGI GOVERNMENT COLLEGE, RECKONG PEO (H.P.)

DEPARTMENT OF BOTANY

Teaching Plan

Class: B.Sc. 1st Year

Paper/Course– Biodiversity (Microbes, Algae, Fungi and Archegoniates) **(BOTA 101)**

Unit	Topic	Details	Month	Method of Teaching
1	Microbes	Viruses – Discovery, general structure, replication (general account), DNA virus (T-phage); Lytic and lysogenic cycle, RNA virus (TMV), Economic importance Bacteria – Discovery, General characteristics and cell structure; Reproduction – vegetative, asexual and recombination (conjugation, transformation and transduction); Economic importance	August (4 Weeks)	PPT/ Lecture/ Videos
2	Algae	General characteristics Ecology and distribution Range of thallus organization and reproduction; Brief account of classification of algae; Morphology and life-cycles of the following: *Nostoc*, *Oedogonium*, *Vaucheria, Ectocarpus, Polysiphonia*. Economic importance of algae	September (4 weeks)	PPT/ Lecture/ Videos/ Field visits
3	Fungi	General characteristics Ecology and significance Range of thallus organization, Cell wall composition , nutrition, reproduction and classification; Morphology and life cycles of *Phytophthora*, *Rhizopus* (Zygomycota) *Penicillium, Venturia* (Ascomycota), *Puccinia, Agaricus* (Basidiomycota); Symbiotic Associations-Lichens: General account, reproduction and significance	October (4 weeks)	PPT/ Lecture/ Videos

4	Bryophytes	General characteristics, Adaptations to land habit, Range of thallus organization. Classification (up to family), morphology, anatomy and reproduction of *Marchantia* and *Funaria*. Ecology and economic importance of bryophytes	November (4 weeks)	PPT/ Lecture/ Videos/ Field visits
5	Pteridophytes	General characteristics, Early land plants (*Cooksonia* and *Rhynia*). Classification (up to family), Morphology, anatomy and reproduction of *Selaginella*, *Equisetum* and *Adiantum*. Heterospory and seed habit, Stelar evolution. Ecological and economical importance.	February (3 weeks)	PPT/ Lecture/ Videos/ Field visits
6	Gymnosperms	General characteristics, Classification (up to family), Morphology, anatomy and reproduction of *Cycas* and *Pinus* Economic importance.		

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THAKUR SEN NEGI GOVERNMENT COLLEGE, KINNAUR (H.P.)

DEPARTMENT OF BOTANY

Teaching Plan

Class: B.Sc. 1st Year

Paper/Course– Plant Ecology and Taxonomy (BOTA 102)

Unit	Topic	Details	Month	Method of Teaching
1 2 3	Introduction Ecological Factors Plant communities	Definition, Scope **Soil:** Origin, formation, composition, soil profile. Water: States of water in the environment, precipitation types. Light and temperature, Shelford law of tolerance. General account of adaptations in xerophytes and hydrophytes. Characters; Ecotone and edge effect; Succession; Processes and types (Hydrosere and Xerosere)	August (4 Weeks)	PPT/ Lecture/ Videos
4 5 6	Ecosystem Introduction to plant taxonomy Identification	Structure; energy flow trophic organisation; Food chains and food webs, Ecological pyramids production and productivity; Biogeochemical cycling- Cycling of Nitrogen and Phosphoros. Identification, Classification, Nomenclature. Functions of Herbarium, Important herbaria and botanical gardens of the world and India; Documentation: Flora, Keys: single access and multi-access	September (4 weeks)	PPT/ Lecture/ Videos/ Field visits
7 8	Taxonomic evidences Taxonomic hierarchy	Taxonomic evidences from cytology, phytochemistry and molecular data. Ranks, categories and taxonomic groups	October (4 weeks)	PPT/ Lecture/ Videos

9	Botanical nomenclature	Principles and rules (ICN); ranks and names; Binominal system, Typification, Author citation, Valid publication, Rejection of names, Principle of priority and its limitations		
10	Classification	Types of classification-artificial, natural and phylogenetic. Bentham and Hooker Engler and Prantl (upto series), Angiosperm Phylogeny Group (APG) - general introduction	November (4 weeks)	PPT/ Lecture/ Videos
11	Biometrics, numerical taxonomy and cladistics	Characters; variations; OTUs, character weighting and coding; cluster analysis; Phenograms, Cladograms	February (3 weeks)	PPT/ Lecture/ Videos

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THAKUR SEN NEGI GOVERNMENT COLLEGE, KINNAUR (H.P.)

DEPARTMENT OF BOTANY

Teaching Plan

Class: B.Sc. 2nd Year

Paper/Course–Plant Anatomy and Embryology (BOTA 201)

Unit	Topic	Details	Month	Method of Teaching
1	Meristematic and permanent tissues	Root and shoot apical meristems; Simple and complex tissues	August (4 Weeks)	PPT/ Lecture/ Videos
2	Organs	Structure of dicot and monocot root stem and leaf.		
3	Adaptive and protective systems	Epidermis, cuticle, stomata	September (4 weeks)	PPT/ Lecture/ Videos
4	Secondary Growth	Vascular cambium – structure and function, seasonal activity. Secondary growth in root and stem, Wood (heartwood and sapwood).		
5	Anomalous Secondary Growth	*Boerhaavia* (Dicot) and *Dracaena* (Monocot)	October (4 weeks)	PPT/ Lecture/ Videos
6	Structural organization of flower	Flower- a modified shoot, Function of floral parts; Structure of anther and pollen; Microsporogenesis, Male gametophyte, Structure and types of ovules; gasporangium, Types of embryo sacs, organization and ultra structure of mature embryo sac	November (4 weeks)	PPT/ Lecture/ Videos
7	Pollination	Pollination mechanisms and adaptations	February (3 weeks)	PPT/ Lecture/ Videos
8	Fertilization	Double fertilization; Seed-structure, appendages and dispersal mechanisms		
9	Embryo and endosperm	Endosperm types, structure and functions; Dicot and monocot		

		embryo; Embryo-endosperm relationship, polyembryony		

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DEPARTMENT OF BOTANY

Teaching Plan

Class: B.Sc. 2nd Year

Paper/Course– Plant Physiology and Metabolism **(BOTA 202)**

Unit	**Topic**	**Details**	**Month**	**Method of Teaching**
1	Introduction Plant-water relations	Applications of plant physiology in agriculture & horticulture Importance of water,Diffusion. Osmosis, water potential and its components; Transpiration and its significance; Factors affecting transpiration; Root pressure and guttation, Mechanism of Stomatal movements.	August (4 Weeks)	PPT/ Lecture/ Videos
2	Mineral nutrition	Essential elements, macro and micronutrients; Criteria of essentiality of elements; Role of essential elements; Transport of ions across cell membrane, active and passive transport, carriers, channels and pumps.	September (4 weeks)	PPT/ Lecture/ Videos
3	**Translocation in phloem**	Composition of phloem sap, girdling experiment; Pressure flow model; Phloem loading and unloading.		
4	Photosynthesis	Photosynthetic Pigments (Chl a, b, xanthophylls, carotene); Photosystem I and II, reaction center, antenna molecules; Electron transport and mechanism of ATP synthesis; C3, C4 and CAM pathways of carbon fixation; Photorespiration.	October (4 weeks)	PPT/ Lecture/ Videos
5	Respiration	Glycolysis, anaerobic respiration, TCA cycle; Oxidative phosphorylation, Glyoxylate, Oxidative Pentose Phosphate Pathway		

6 7 8	Enzymes Nitrogen metabolism Plant growth regulators	Structure and properties; Mechanism of enzyme catalysis and enzyme inhibition. Biological nitrogen fixation; Nitrate and ammonia assimilation Discovery and physiological roles of:- Auxins, Gibberellins, Cytokinins, ABA, Ethylene.	November (4 weeks)	PPT/ Lecture/ Videos
9	Plant response to light and temperature	Photoperiodism (SDP, LDP, Day neutral plants); Phytochrome (discovery and structure), red and far red light responses on photomorphogenesis; Vernalization. Practical applications of vernalization and photoperiodism	February (3 weeks)	PPT/ Lecture/ Videos

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DEPARTMENT OF BOTANY

Teaching Plan

Class: B.Sc. 3rd Year

Paper/Course– Economic Botany and Biotechnology (BOTA 301)

Unit	Topic	Details	Month	Method of Teaching
1	Cultivated Plants	Introduction, Research centres, Concept of centres of origin, their importance with reference to Vavilov's work	August (4 Weeks)	PPT/ Lecture/ Videos
2	Cereals	Wheat and Rice -Origin, morphology, uses		
3	Pulses & Vegetables	General account with special reference to Gram , soybean and Potato		
4	Spices	General account with special reference to clove, black pepper, cinnamon, Ginger and Turmeric (Botanical name, family, part used, morphology and uses)	September (4 weeks)	PPT/ Lecture/ Videos/ Field visits
5	Beverages	Tea and Coffee (morphology, processing, uses)		
6	Oils and Sugar	General description with special reference to groundnut and sugarcane		
7	Fibre Yielding Plants	General description with special reference to Cotton (Botanical name, family, partused, morphology and uses)	October (4 weeks)	PPT/ Lecture/ Videos
8	Medicinal Plants	Brief account of Ocimum, Tinospora,		

		Aloe, Rauvolfia, Emblica and Cathranthus		
9	Introduction to Biotechnology	Tissue culture techniques, Micropropagation; haploid production through androgenesis and gynogenesis; brief account of embryo & endosperm culture; Applications of plant tissue culture in agriculture, horticulture and forestry.	November (4 weeks)	PPT/ Lecture/ Videos
10	Biotechnological Techniques	Introduction to r-DNA, Cloning vehicles, Gene transfer techniques in plants, Transgenic plants, Agarose electrophoresis, Blotting techniques: Northern, Southern and Western Blotting, DNA Fingerprinting; Molecular DNA markers i.e. RAPD, RFLP, SNPs; DNA sequencing, PCR and Reverse Transcriptase-PCR. ELISA, Hybridoma and monoclonal antibodies, ELISA and Immuno detection. Molecular diagnosis of human disease, Human gene Therapy.	February (3 weeks)	PPT/ Lecture/ Videos

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DEPARTMENT OF BOTANY

Teaching Plan

Class: B.Sc. 3rd Year

Paper/Course– Cell and Molecular Biology **(BOTA 303)**

Unit	**Topic**	**Details**	**Month**	**Method of Teaching**
1	Techniques in Biology	Principles of microscopy; Light Microscopy; Phase contrast microscopy; Fluorescence microscopy; Electron microscopy (EM)- Scanning EM and Scanning Transmission EM (STEM); Sample ; X-ray diffraction analysis	August (4 Weeks)	PPT/ Lecture/ Videos
2	Cell as a unit of Life	The Cell Theory; Prokaryotic and eukaryotic cells; Cell size and shape; Eukaryotic Cell components.		
3	Cell Organelles	Mitochondria: Structure, marker enzymes, composition; Semiautonomous nature; Symbiont hypothesis; Proteins synthesized within mitochondria; mitochondrial DNA. Chloroplast Structure, marker enzymes, composition; semiautonomous nature, chloroplast DNA. ER, Golgi body & Lysosomes: Structures and roles. Peroxisomes and Glyoxisomes: Structures, composition, functions in animals and plants and biogenesis. Nucleus: Nuclear Envelope- structure of nuclear pore complex; Chromatin; molecular organization,	September (4 weeks)	PPT/ Lecture/ Videos

		DNA packaging in eukaryotes, euchromatin and heterochromatin, nucleolus and ribosome structure.		
4 5	Cell Membrane and Cell Wall Cell Cycle	The functions of membranes; Models of membrane structure; The fluidity of membranes; Membrane proteins and their functions; Carbohydrates in the membrane; Faces of the membranes; Selective permeability of the membranes; Cell wall. Overview of Cell cycle, Mitosis and Meiosis; Molecular controls.	October (4 weeks)	PPT/ Lecture/ Videos
6	Genetic material	DNA: Miescher to Watson and Crick- historic perspective, Griffith's and Avery's transformation experiments, Hershey-Chase bacteriophage experiment, DNA structure, types of DNA, Types of genetic material. A replication Prokaryotes and eukaryotes bidirectional replication, semi–conservative, semi discontinuous R A priming, Ø theta mode of replication, replication of linear, ds- A, Replicating the end of linear chromosome including replication enzymes.	November (4 weeks)	PPT/ Lecture/ Videos
7	Transcription	Types of structures of RNA (mRNA, tRNA, rRNA), RNA polymerase- various types; Translation (Prokaryotes and eukaryotes), genetic code.	February (3 weeks)	PPT/ Lecture/ Videos

8	Regulation of gene expression	Prokaryotes: Lac operon and Tryptophan operon ; and in Eukaryotes		

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DEPARTMENT OF BOTANY

Teaching Plan

Class: B.Sc. 2nd Year

Paper/Course– Biofertilizers **(BOTA 203)**

Unit	**Topic**	**Details**	**Month**	**Method of Teaching**
1	Fertilizers	Introduction, Types of fertilizers and their advantages and disadvantages, Brief account of microbes used as biofertilizer, Marketable forms of biofertilizers.	August (4 Weeks)	PPT/ Lecture/ Videos
2	Rhizobium	General account, Isolation, Identification, Mass multiplication, Carrier based inoculants, Application, Crop response		
3	Actinorrhizal Symbiosis	*Frankia*, Host-microsymbiont relationship, Isolation, Culture, Application and Advantages	September (4 weeks)	PPT/ Lecture/ Videos
4	Azospirillum	*Isolation and mass multiplication, Carrier based inoculant, Crop response*		
5	Azotobacter	*Characteristics, Isolation and mass multiplication, Application and Crop response*	October (4 weeks)	PPT/ Lecture/ Videos
6	Phosphate Solubilizing Organisms	*Introduction, Isolation, Culture and Applications*		
7	Cyanobacteria	*Azolla and Anabaena azollae association, Nitrogen fixation, Factors affecting growth, Blue green algae and Azolla in rice cultivation*	November (4 weeks)	PPT/ Lecture/ Videos
8	Mycorrhizal Association	*Types of mycorrhizal association, Taxonomy, Occurrence and distribution, Phosphorus nutrition, Growth and yield; VAM – Isolation and inoculum*		

		production, Influence on growth and yield of crop plants.		
9	Organic Farming	Green manuring and organic fertilizers, Recycling of biodegradable municipal, agricultural and Industrial wastes; Biocompost making methods, Types and method of vermicomposting, field Application.	February (3 weeks)	PPT/ Lecture/ Videos

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DEPARTMENT OF BOTANY

Teaching Plan

Class: B.Sc. 2nd Year

Paper/Course– Gardening and Floriculture (BOTA 204)

Unit	Topic	Details	Month	Method of Teaching
1	Landscape Gardening and Floriculture	Definitions of Landscape Gardening and Floriculture, history of gardening, importance, status and scope of Floriculture and Landscaping; landscaping of homes, educational institutions, highways and public parks	August (4 Weeks)	PPT/ Lecture/ Videos/ Field Visits
2	Gardening operations	Soil laying, Manuring, Watering, Management of pests and diseases; Soil sterilization; Seed sowing; Pricking; Planting and transplanting; Shading; Stopping or pinching; Defoliation; Mulching; Pruning, Topiary making.		
3	Garden Designs, Principles, Types and Features	Principles and Elements of Garden Designs, Formal and Informal gardens, English, Mughal and Japanese gardens; Features of a garden (Garden wall, Fencing, Steps, Hedge, Edging, Lawn, Flower beds, Shrubbery, Borders, Rock garden, Water garden. Some Famous gardens of India.	September (4 weeks)	PPT/ Lecture/ Videos/ Field visits
4	Propagation of Garden Plants	Sexual and vegetative methods of propagation; Role of plant growth regulators.	October (4 weeks)	PPT/ Lecture/ Videos/ Field visits

7	Post Harvest Management	Post- harvest handling of important flower crops, Methods to prolong vase life, packaging, storage and transport of flower crops, Flower arrangements and other floral crafts		
5	Ornamental Plants	Flowering annuals; Herbaceous perennials; Shrubs, Climbers; Ornamental trees; Ornamental bulbous plants; Palms and Cycads; Potted plants and indoor gardening; Bonsai.	November (4 weeks)	PPT/ Lecture/ Videos
6	Commercial Floriculture	Factors affecting growth and flower production of ornamentals; Cultivation of Important flower crops (Carnation, Chrysanthemum, Gerbera, Gladiolus, Marigold, Rose, Lilium)	February (3 weeks)	PPT/ Lecture/ Videos

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DEPARTMENT OF BOTANY

Teaching Plan

Class: B.Sc. 3rd Year

Paper/Course– Medicinal Botany and Ethnobotany **(BOTA 306)**

Unit	**Topic**	**Details**	**Month**	**Method of Teaching**
1	Traditional Systems of Medicine	Brief history of use of medicinal herbs; Introduction to indigenous systems of medicines- Ayurveda, Unani and Siddha system of medicine	August (4 Weeks)	PPT/ Lecture/ Videos
2	Ethnobotany	Introduction, concept, scope and objectives; Ethnobotany as an interdisciplinary science. The relevance of ethnobotany in the present context; Major and minor ethnic groups or Tribals of India, and their life styles.	September (4 weeks)	PPT/ Lecture/ Videos/
3 4	Plants Used by the Tribals Methodology of Ethnobotanical Studies	a) Food plants b) intoxicants and beverages c) Resins and oils and miscellaneous uses. d Sacred plants a) Field work b) Herbarium c) Ancient Literature d) Archaeological findings e) temples and sacred places.	October (4 weeks)	PPT/ Lecture/ Videos
5	Role of ethnobotany in modern Medicine	Medico-ethnobotanical sources in India; Significance of the following plants in ethno botanical practices (along with their habitat and morphology) a) *Azadiractha indica* b) *Ocimum sanctum* c) *Vitex negundo*. d) *Gloriosa superba* e) *Tribulus terrestris* f) *Pongamia pinnata* g) *Cassia auriculata* h) *Indigofera tinctoria*.	November (4 weeks)	PPT/ Lecture/ Videos

		Role of ethnobotany in modern medicine with special example *Rauvolfia sepentina, Taxus wallichiana, Trichopus zeylanicus, Artemisia, Withania*.		
6	conservation of plant genetic resources	Role of ethnic groups in conservation of plant genetic resources. Endangered taxa and forest management (participatory forest management)	February (3 weeks)	PPT/ Lecture/ Videos
7	Ethnobotany and Legal Aspects	Ethnobotany as a tool to protect interests of ethnic groups. Sharing of wealth concept with few examples from India. Biopiracy, Intellectual Property Rights and Traditional Knowledge.		

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DEPARTMENT OF BOTANY

Teaching Plan

Class: B.Sc. 3rd Year

Paper/Course– Mushroom Cultivation Technology (BOTA 307)

Unit	Topic	Details	Month	Method of Teaching
1	Introduction	Introduction, history. Nutritional and medicinal value of edible mushrooms; Nutrition and nutraceuticals – Proteins, amino acids, mineral elements nutrition, carbohydrates, crude fibre content, vitamins; Poisonous mushrooms.	August (4 Weeks)	PPT/ Lecture/ Videos
2	Cultivation Technology	Infrastructure: substrates (locally available) Polythene bag, vessels, Inoculation hook, inoculation loop, low cost stove, sieves, culture rack, mushroom unit (Thatched house) water sprayer, tray, small polythene bag. Pure culture: Medium, Sterilization, Preparation of spawn, Multiplication	September (4 weeks)	PPT/ Lecture/ Videos/ Field visits
3	Cultivation practices	Cultivation practices of *Agaricus bisporus*, *Pleurotus* sp. and *Volvoriella volvacea*. Composting technology in mushroom production, Low cost technology, Mushroom bed preparation - paddy straw, sugarcane trash, maize straw, banana leaves. Factors affecting the mushroom bed preparation.	October (4 weeks)	PPT/ Lecture/ Videos/ Field Visits
4 5	Storage Food Preparation	Short-term storage (Refrigeration - upto 24 hours) Long term Storage (canning, pickels, papads), drying, storage in salt solutions Types of foods prepared from mushroom. Research Centres -National level and	November (4 weeks)	PPT/ Lecture/ Videos

		Regional level. Cost benefit ratio - Marketing in India and abroad, Export Value		
6	Diseases and Pests of Mushrooms	Diseases and Pests of Mushrooms	February (3 weeks)	PPT/ Lecture/ Videos

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