GOUR MAHAVIDYALAYA
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1.3 - Curriculum Enrichment

1.3.1 - Institution integrates crosscutting issues relevant to Professional Ethics, Gender, Human Values, Environment and Sustainability into the Curriculum:

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1.3 Curriculum Enrichment

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CBCS: 2019-23

SUBJECT	SEMESTER	COURSE CODE	TOPIC IN THE CURRICULUM
ALL HONOURS AND GENERAL	I	104AECIENVS	ENVIRONMENTAL SCIENCE
ARABIC	I	104ENVS	ENVIRONMENTAL SCIENCE
BENGALI	I	103LCI	IJJAT
BENGALI	I	203LC-1	VISVA PARICHAY
ENGLISH	IV	8	INDIAN CLASSICAL LITERAURE
ENGLISH	VI	14	WOMEN'S WRITINGS
EDUCATION	I	DSE-7	CONTEMPORARY ISSUES IN INDIAN EDUCATION-WOMEN EDUCATION
EDUCATION	III	GE-3	ENVIRONMENTAL EDUCATION
GEOGRAPHY	VI	SEC-2	CLIMATE CHANGE
GEOGRAPHY	VI	GE-2A	CLIMATOLOGY,SOIL, BIO-GEOGRAPHY
HISTORY	IV	DC-9	WOMEN: CHANGING POSITION AND ATTITUTED
HISTORY	VI	DSE-3-B	GENDER AND EDUCATION
POLITICAL SCIENCE	VI	PL:SH: DSE:3B	INDIAN POLITICAL THOUGHT
POLITICAL SCIENCE	IV	DC-8	WOMEN,POWER AND POLITICS
SANSKRIT	IV	401SANH-C-8	SELF MANAGEMENT IN THE GITA
SOCIOLOGY	I	DC-I	INTRODUCTION TO SOCIOLOGY: VALUES
SOCIOLOGY	I	DC-2	FOUNDATION OF SOCIAL THOUGHT

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Response: BOS of Botany, University of Gaur Banga, Malda, has prepared curriculum, and various crosscutting issues relevant to Professional Environment and Sustainability are highlighted in the syllabus by the Department of Botany:

CBCS-Semester	Paper	Topic
I-Environment and Sustainability	DC-1- **Algae and Microbiology**	**Algae and Microbiology**
I- Environment and Sustainability	DC –2- **Fungi, Lichens and Plant Pathology**	**Fungi, Lichens and Plant Pathology**
II- Environment and Sustainability	**DC 3: Archegoniate (Bryology, Pteridology, Gymnology) and Paleobotany**	**Archegoniate (Bryology, Pteridology, Gymnology) and Paleobotany**
II- Environment and Sustainability	**DC 4: Morphology and Anatomy of Angiosperms**	**Morphology and Anatomy of Angiosperms**
III- Environment and Sustainability	DC 5: Plant Systematics	Plant Systematics
III- Environment and Sustainability	DC 6: Plant Ecology and Phytogeography and Biodiversity	Plant Ecology and Phytogeography and Biodiversity

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Discipline Core (DC)
YEAR 1: SEMESTER I
(Credits: Theory-4, Practical-2)

DC 1: PAPER-1: Algae and Microbiology

(Theory) (Total Lectures 60)

Algae

1. General characteristics; Ecology and distribution; range of thallus organization; Cell structure
2. and components; cell wall, pigment system, reserve food (of only groups represented in the
3. syllabus), flagella; methods of reproduction;
4. Classification; criteria, system of Fritsch, and evolutionary classification of Lee (only upto groups);
5. Cyanophyta and Xanthophyta: Characteristic features, Morphology and life-cycle of *Anabaena* (Asexual cycle) and *Vaucheria,* Ultra Structure of cell; Heterocyst and role in N2 fixation.
6. Chlorophyta and Charophyta: Characteristic features, Morphology and life-cycle of *Chlamydomonas, Volvox, Oedogonium and Chara.*
7. Phaeophyta and Rhodophyta: Characteristic features, Morphology and life-cycle of*Ectocarpus* and *Polysiphonia.*
8. Diatom: Cell structure, Cell division, Auxospore formation in Centrales and Pennales.
9. Role of algae in the environment, agriculture, biotechnology and industry.: Biotechnology potential of microalgae for SCP; Production of Agar-agar; Algae as bio-fertilizer; Mass cultivation of algae for bio-diseal production.

Microbiology

1. Introduction to microbial world: Discovery, general characteristics; Types-archaebacteria, eubacteria, wall-less forms (mycoplasma and spheroplasts); Cell structure: Flagella (ultrastructure) & Pilli; Cell wall – chemical structure and differences between Gram +ve & Gram – ve bacteria; Bacterial genome and plasmid; Endospore - formation, structure and function.
2. Bacterial reproduction: Vegetative and asexual; Genetic Recombination (a) Transformation – with special emphasis on Natural and Induced competence and DNA uptake, (b) Conjugation – F- factor, F+ x F–, Hfr x F–, concept of F, chromosome mobilization, (c) Transduction–Generalised and specialized.
3. Economic importance of bacteria: Industrial Production of Vinegar and Streptomycin (brief outline); Enzyme (Amylase, Protease); Plant Growth Promoting Rhizobacteria (PGPR): Biological nitrogen fixation and nodulation process in legumes. Role of PGPR in agriculture as Biofertilizer and Biopesticides. Concept of Bioplastics.
4. **Viruses:** Discovery, physiochemical and biological characteristics; classification (Baltimore), general, structure with special reference to viroids and prions; replication (general account),
5. DNA virus, (T-phage), lytic and lysogenic cycle; RNA virus (TMV). Economic importance of viruses with reference to vaccine production, role in research, medicine and diagnostics, as causal organisms of plant diseases

DC2: PAPER 3: Fungi, Lichens and Plant Pathology
(Theory) (Total Lectures 60)

Fungi and Lichens

1. Introduction to true fungi; General characteristics; Thallus organization; Cell wall composition;; Teleomorphic and Anamorphic; Degeneration of sex in fungi; Parasexuality; Nutrition; Life Cycle Patterns.
2. Classification (Ainsworth 1973) up to sub-division diagnostic characters and examples.
3. Characteristic features; Ecology and significance; Thallus organisation; Reproduction; Life cycle with reference to *Rhizopus, Ascobolus, Agaricus* and *Penicillium.*
4. Symbiotic associations: Lichen – Occurrence; General characteristics; Growth forms and range of thallus organization; Nature of associations of algal and fungal partners; Reproduction and ecological role in pollution monitoring; Mycorrhiza- Ectomycorrhiza, Endomycorrhiza, Phosphate mobilization by AMF. Significance and role in Agriculture.
5. Applied Mycology: Role of fungi in biotechnology; Application of fungi in food industry. Fungi as Biocontrol agents; Mycotoxins.
6. Industrial production of Cheese, Ethanol, Baker's yeast, Amylase and Rivoflavin.

Plant Pathology

1. Introduction to plant pathology; Plant pathology in India and Global prospective; Concept of Disease in Plants and Types of Diseases.
2. Terms and definitions: Disease concept, Symptoms, Etiology, Inoculum and Infection, Pathogenesis, SAR and ISR, Disease triangle and disease cycle, Epidemic and Endemic, Sporadic and Pandemic Disease. Koch's postulate.
3. Mechanism of infection (Pre-penetration, Penetration and Post-Penetration), Plant defense responses with reference to Phytoalexins and PR proteins. Signal transduction leading to SAR and ISR.
4. Concept of plant disease management: IPM, Chemical, Biological and Quarantine. Concept of crop rotation.
5. Symptoms, Causal organism, Disease cycle and control measures of: Bacterial diseases – Citrus canker, Viral diseases – Tobacco Mosaic Disease. Fungal diseases – Late blight of potato and Black stem rust of wheat.
6. Worldwide development of plant pathology as a profession: Indian and International institutions of crop protection, Plant disease clinics.

Discipline Core (DC)

YEAR 1 SEMESTER II

(Credits: Theory-4, Practical-2)

DC 3: PAPER 5: Archegoniate and Paleobotany

(Theory) (Total Lectures 60)

1. Introduction: Unifying features of archegoniates; Transition to land habit; Alternation of generations.
2. **Bryophytes:** General characteristics; Adaptations to land habit; Classification (Proskauer, 1957) up to class. Range of thallus organization. Ecological and economic importance of bryophytes with special reference to *Sphagnum*.
3. Type Studies- Bryophytes: Morphology, anatomy and reproduction and sporophyte development and alternation of generation of *Marchantia, Anthoceros, Sphagnum and Funaria.*
4. **Pteridophytes:** General characteristics; Classification up to class (Sporne, 1975); Concept of heterospory and origin of seed habit; Apogamy, and apospory; Stelar evolution. Ecological and economic importance of pteridophytes. Early land plants *Rhynia* and *Lepidodendron* (Reconstructed).
5. Type Studies- Pteridophytes: Morphology, anatomy and reproduction of *Psilotum*, *Lycopodium*, *Selaginella*, *Equisetum* and *Pteris* (Developmental details not to be included).
6. **Gymnosperms:** General characteristics, classification up to order (Stewart and Rothwell, 1993), Ecological and economic importance.
7. Vegetative morphology, anatomy and reproduction of *Cycas*, *Pinus* and *Gnetum* (Developmental details not to be included)
8. **Paleobotany:** Fossil: types and modes of preservation (Schopf, 1975), conditions of preservations, fossilization process;Geological time scale and major events of plant life through geological ages.: Indian Gondwana system with major megafossil assemblages; Importance of study of fossil.

DC 4 : PAPER 7: Morphology and Anatomy of Angiosperms

(Theory) (Total Lecture 60)

1. Introduction to angiospermic morphology, Palynology and Anatomy, scope and applications in systematics, forensic and pharmacognosy.
2. Leaf: Types, Margin, Base, Venation and Phyllotaxy, Petiole and modifications.
3. Inflorescence: types with examples; Flower: Floral parts, Thalamus and insertion of floral parts, Calyx, Corolla, Aestivation, Perianth, floral diagram and floral formula. Stamen: Types and anther shape. Carpel : types, placentation-types, ovule structure and types; Fruit types with examples.
4. Meristimatic and permanent tissues: Organization of shoot apex (Tunica-corpus concept) and organization of root apex (Korper-Kappe concepts); Structure of dicot and monocot leaf, Kranz anatomy. Structure of Xylem and Phloem tissue; Types and evolution of stele; Vascular bundle -types and function. Root-Stem transition and its significance; Normal and Anomalous secondary growth (citing examples of *Bignonia* and *Dracaena* and *Tinospora* root), different types of wood. Concept and application of Dendrochronology.
5. Adaptive and Protective Systems: Epidermal tissue system, cuticle, epicuticular waxes, trichomes(uni- and multicellular, glandularand nonglandular, two examples of each), stomata (classification); Adcrustation and incrustation;Anatomical adaptations of xerophytes and hydrophytes.

Discipline Core (DC)

YEAR 2: SEMESTER III

(Credits: Theory-4, Practical-2)

DC 5: PAPER 9: Plant Systematics

(Theory) (Total Lecture 60)

1. Significance of Plant systematics: Introduction to systematics; Plant identification, Classification, Nomenclature. Field inventory; Functions of Herbarium; Important herbaria and botanical gardens of the world and India; Virtual herbarium; E-flora; Documentation: Flora, Monographs, Journals; Keys: Single access and Multi-access.
2. Taxonomic hierarchy: Concept of taxa (family, genus, species); Categories and taxonomic hierarchy; Species concept (taxonomic, biological, evolutionary).
3. Botanical nomenclature: Principles and rules (ICN); Ranks and names; Typification, author citation, valid publication, rejection of names, principle of priority and its limitations; Names of hybrids.
4. Systems of classification: Major contributions of Theophrastus, Bauhin, Tournefort, Linnaeus, Adanson, de Candolle, Bessey, Hutchinson, Takhtajan and Cronquist; Outline of classification systems of Linnaeus (1753), Bentham and Hooker (1862-1883) upto series and Engler and Prantl (upto series); Brief reference of Angiosperm Phylogeny Group (APG III) classification.
5. Biometrics, numerical taxonomy and cladistics : Characters; Variations; OTUs, character weighting and coding; Cluster analysis; Phenograms, cladograms (definitions and differences).
6. Phylogeny of Angiosperms:Terms and concepts (primitive and advanced, homology and analogy, parallelism and convergence, monophyly, Paraphyly, polyphyly and clades). Origin and evolution of angiosperms; Co-evolution of angiosperms and animals; Methods of illustrating evolutionary relationship (phylogenetic tree, cladogram).
7. Diagnostic features of Families: **Dicotyledons-** Ranunculaceae, Brassicaceae, Malvaceae, Leguminosae (sensu lato), Apiaceae, Solanaceae, Lamiaceae, Cucurbitaceae, Rubiaceae, Euphorbiaceae, Asteraceae. **Monocotyledons**-Alismataceae, Poaceae, Zingiberaceae and Orchidaceae.

DC 6: PAPER 11: Plant Ecology , Phytogeography and Biodiversity

(Theory) (Total Lecture 60)

1. Introduction : Basic concepts; Levels of organization. Inter-relationships between the living world and the environment, the components and dynamism, homeostasis.
2. **Soil**: Importance; Origin; Formation; Composition; Physical; Chemical and Biological components; Soil profile; Role of climate in soil development. **Water**: Importance: States of water in the environment; Atmospheric moisture; Precipitation types (rain, fog, snow, hail, dew); Hydrological Cycle; Water in soil; Water table.
3. **Trophic organization**: basic source of energy, Models of energy flow, autotrophy, heterotrophy; symbiosis, commensalism, parasitism; food chains and webs; ecological pyramids; biomass, standing crop. **Population ecology:** Characteristics and Dynamics .Ecological Speciation
4. **Plant communities:** Concept of ecological amplitude; Habitat and niche; Characters: analytical and synthetic; Ecotone and edge effect; Dynamics: succession – processes, types; climax concepts.
5. **Ecosystems:** Structure; Processes; Trophic organisation; Food chains and Food webs; Ecological pyramids. **Functional aspects of ecosystem:** Principles and models of energy flow; Production and productivity; Ecological efficiencies; Biogeochemical cycles; Cycling of Carbon, Nitrogen and Phosphorus.
6. **Phytogeography**: Principles; Continental drift; Theory of tolerance; Endemism; Brief description of major terrestrial biomes (one each from tropical, temperate & tundra); Phytogeographical division of India; Local Vegetation.
7. **Plant Biodiversity:** Biodiversity and Conservation: Biodiversity – definition, scope, types (genetic, species and ecosystem), importance and threats; Threatened plants (IUCN Categories); knowledge on Red Data Book; Hotspots.
8. *In situ* and *ex situ* conservation strategies for rare and endangered plants with emphasis on National parks, Sanctuaries and Biosphere reserves, seed banks, cryopreservation in India.

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