


**1.3.1 Institution Integrates Crosscutting
issues relevant to Professional Ethics,
Gender, Human Values, Environment and
Sustainability into the Curriculum .**

Nilkanthrao Shinde Science and Arts College, Bhadrawati Dist – Chandrapur

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

| S. N. | Programme name | Paper | Description |
|-------|----------------------------------|----------------------------|---|
| 1 | B. Sc. Sem III & IV All Subjects | Skill Development | Environmental Studies |
| 2 | B. Sc. Sem I Microbiology | Paper- I | Fundamentals of Microbiology |
| 3 | B. Sc. Sem II Microbiology | Paper- II | Applied Microbiology |
| 4 | B. Sc. Sem III Microbiology | Paper- II | Food, Soil Microbiology |
| 5 | B. Sc. Sem IV Microbiology | Paper- I | Industrial Microbiology |
| 6 | B. Sc. Sem I Zoology | Core Paper II | Cell Biology |
| 8 | B. Sc. Sem II Zoology | Core Paper IV | Paper- II Genetics and Evolution |
| 9 | B. Sc. Sem III Zoology | Core Paper V and Practical | Paper- I Animal Diversity |
| 10 | M. Sc. Sem. III Zoology | Paper X | Fresh Water Aquaculture |
| 11 | M. Sc. Sem. III Zoology | Paper XI | Aquaculture and Rural Development |
| 12 | B. Sc. Sem I Botany | Paper- I | Plant Diversity-I |
| 13 | B. Sc. Sem I Botany | Paper- II | Plant Diversity-II |
| 14 | B. Sc. Sem III Botany | Paper- I | Reproductive Biology of Angiosperms, Plant Growth and Development |
| 15 | B. Sc. Sem III Botany | Paper- II | Plant Biochemistry and Physiology |
| 16 | B. Sc. Sem V Botany | Skill Enhancement Course | Gardener Training, Mashroom Culture |
| 17 | B. Sc. Sem V Botany | Paper- I | Genetics and Plant Breeding- I |
| 18 | B. Sc. Sem V Botany | Paper- II | Genetics and Plant Breeding- II |
| 19 | B. A. Sem I Sociology | ---- | Sociology |
| 20 | B. A. Sem II Sociology | ---- | Indian Society |


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SCHEME AND SYLLABUS UNDER CHOICE BASED CREDIT SYSTEM (CBCS) FOR B.Sc. ZOOLOGY

| Semester | Core Course (12) | Ability Enhancement Compulsory Courses AEC(2) | Skill Enhancement (Foundation) Courses SEC(4) | Discipline Specific Elective (DSE) |
|----------|---|---|---|---|
| I | CC - Chemistry P -I CC - Chemistry P -II CC - Botany P -I CC - Botany P -II CC - Zoology P -I CC - Zoology P -II | English (1) Marathi (1) | | |
| II | CC - Chemistry P -III CC - Chemistry P -IV CC - Botany P -III CC - Botany P -IV CC - Zoology P -III CC - Zoology P -IV | English (1) Marathi (1) | | |
| III | CC - Chemistry P -V CC - Chemistry P -VI CC - Botany P -V CC - Botany P -VI CC - Zoology P -V CC - Zoology P -VI | | Environmental Studies | |
| IV | CC - Chemistry P -VII CC - Chemistry P -VIII CC - Botany P -VII CC - Botany P -VIII CC - Zoology P -VII CC - Zoology P -VIII | | Environmental Studies | |
| | CC - Chemistry P -IX CC - Chemistry P -X CC - Botany P -IX CC - Botany P -X CC - Zoology P -IX CC - Zoology P -X | | (Any one) 1. Apiculture 2. Sericulture 3. Vermiculture and Lac Culture 4. Aquarium fish Culture | DSE-Chem I DSE - Bot I DSE - Zoo I (Any One) 1. Parasitology 2. Applied Zoology 3. Insect Vectors and disease 4 Aquatic Biology |

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| | | | | |
|----|---|--|---|---|
| VI | CC - Chemistry P -XI CC - Chemistry P -XII CC - Botany P -XI CC - Botany P -XII CC - Zoology P -XI CC - Zoology P -XII | | 1. Medical diagnosis 2. Public Health & Hygiene 3. Research Methodology and Instrumentation | DSE- Chem II DSE - Bot II DSE - Zoo II (Any One) 1. Immunology 2. Animal Biotechnology 3. Micro-technique. Bioinformatics and Biostatistics |
|----|---|--|---|---|

Discipline Core Courses (DCC) : Zoology

1. Animal Diversity
2. Cell Biology, Genetics and Evolutionary Biology
3. Comparative Anatomy and Developmental Biology of Vertebrates
4. Physiology and Biochemistry

Discipline Specific Electives (DSE): Zoology (Any two)

1. Applied Zoology
2. Animal Biotechnology
3. Aquatic Biology
4. Immunology
5. Reproductive Biology
6. Insect, Vector and Diseases

Skill Enhancement Courses (SEC): Zoology

1. Apiculture
2. Aquarium Fish Keeping
3. Aquatic Biology
4. Medical Diagnostics
5. Public Health and Hygiene
6. Sericulture

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GONDWANA UNIVERSITY, GADCHIROLI
CHOICE BASED CREDIT SYSTEM (CBCS) SYLLABUS
PROGRAMME- BACHELOR OF SCIENCE (B.Sc.), SEMESTER-III
SUBJECT- ZOOLOGY, THEORY (CREDITS 2)
CORE PAPER V
USCZOT05

Paper I - ANIMAL DIVERSITY (CHORDATES) AND COMPARATIVE ANATOMY

- Unit- I** (12 periods)
1. Urochordata- General characters, Ascidian tadpole and retrogressive metamorphosis
 2. Cephalochordata- General characters, Amphioxus - External morphology and digestive system.
 3. Cyclostomata- General characters, external morphology of-Petromyzon and Myxine.
 4. Pisces- General characters and Classification up to order; Osmoregulation in Fishes, Accessory respiratory organs.
- Unit-II** (12 periods)
1. Amphibia- General characters and Classification up to order. Parental care and Neoteny.
 2. Reptilia- General characters and Classification based on temporal vacuities. Snake venom, Poison apparatus & biting mechanism, Poisonous and non poisonous snake
- Unit-III** (12 periods)
1. Aves – General characters and classification up to order. Flight adaptations (Morphological, Anatomical and Physiological), Birds migration and its significance
 2. Mammals – General characters and classification up to order. Prototheria, Metatheria and Eutheria.
- Unit-IV : Comparative anatomy** (12 periods)
1. Comparative account of derivatives of integuments (Scale and horn).
 2. Comparative account of aortic arches and heart.
 3. Types of receptors (General cutaneous receptors and chemoreceptor).
 4. Comparative account of Urinogenital system.


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GONDWANA UNIVERSITY, GADCHIROLI
CHOICE BASED CREDIT SYSTEM (CBCS) SYLLABUS
PROGRAMME- BACHELOR OF SCIENCE (B.Sc.), SEMESTER-III
SUBJECT- ZOOLOGY, PRACTICAL (CREDITS 2)
CORE COURSE-V & VI
USZOP03
PRACTICAL
B.Sc. II (Zoology), Semester-III
(Animal Diversity, Comparative Anatomy & Physiology and Biochemistry-I)

Section A - Animal Diversity, Comparative Anatomy

1. Identification and Classification of museum specimens

- a. Urochordates : Herdmania, Salpa, Doliolum
- b. Cephalochordate : Amphioxus
- c. Cyclostomata: Myxine, Petromyzon
- d. Pisces : Pristis, Torpedo, Notopterus, Exocoetus, Clarius, Ophiocephalus, Catla, Labeo, Mrigal
- e. Amphibia : Bufo, Salamandra, Ichthyophis
- f. Reptilia : Chameleon, Varanus, Phrynosoma, Draco, Tortoise, Naja , Bungarus, Hydrophis.
- g. Aves : Owl, Woodpecker, Kingfisher, Kite, Duck, Parrot
- h. Mammals: Squirrel, Mongoose, Bat, Loris, Rabbit

2. Anatomical Observations

Anatomical observations, demonstration and detailed explanation of the following with the help of ICT tools/ models/ charts/ photographs etc. (Any locally available fish)

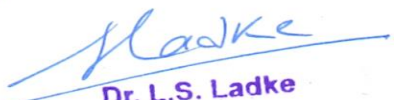
- a) Digestive system
- b) Reproductive system
- c) Brain and Cranial Nerves

3. Study of skeleton of Rabbit or Fowl

(Loose bones of skull not to be studied)

5. Study of permanent slides-

Fish scales - Placoid, Cycloid and Ctenoid, V.S. Skin of Frog and Mammal.


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C.B.C.S. SYLLABUS
PROGRAMME- BACHELOR OF SCIENCE (B.Sc.), SEMESTER-II
SUBJECT- ZOOLOGY, THEORY (CREDITS 2)
CORE PAPER IV
USZOT04

PAPER -II - GENETICS AND EVOLUTION

Unit 1: Introduction to Genetics

(12 Periods)

Mendelian Genetics - Mendel's work on transmission of traits, Laws of Genetics
Interaction of genes - Incomplete dominance and Codominance, Multiple alleles, Lethal alleles, Epistasis, Sex linked inheritance, extra-chromosomal inheritance (Kappa particles)

Unit 2: Linkage, Crossing Over, Syndrome and Mutation

(12 Periods)

Linkage and crossing over
Down's Syndrome, Klinefelter's Syndrome, Turner's Syndrome
Chromosomal Mutations - Deletion, Duplication, Inversion, Insertion, Translocation, Aneuploidy and Polyploidy
Gene mutations- Induced and Spontaneous mutations.

Unit 3: History of Life

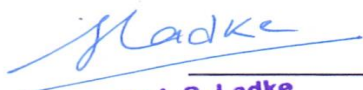
(12 Periods)

Major Events in History of Life - Urey-Miller Experiment, Oparin theory
Introduction to Evolutionary Theories - Lamarckism, Darwinism, Neo-Darwinism
Direct Evidences of Evolution - Types of fossils, Incompleteness of fossil record, Dating of fossils, Evolution of horse

Unit 4: Processes of Evolutionary Change

(12 Periods)

Isolating Mechanisms; Natural selection (Example: Industrial melanism)
Types of natural selection (Directional, Stabilizing, Disruptive), Artificial selection
Species Concept - Biological species concept (Advantages and Limitations); Modes of speciation (Allopatric, Sympatric and peripatric)
Macro-evolution - Macro-evolutionary Principles (example: Darwin's Finches)
Extinction - Mass extinction - Causes, and Role of extinction in evolution




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C.B.C.S. SYLLABUS
PROGRAMME- BACHELOR OF SCIENCE (B.Sc.), SEMESTER-I
SUBJECT- ZOOLOGY, THEORY (CREDITS 2)
CORE PAPER II
USZOT02

Paper II - CELL BIOLOGY

- Unit 1:** (12 Periods)
Cell theory- Protoplasmic theory, Organismal theory, Prokaryotic and Eukaryotic cell,
Biological membrane-Chemical composition, Sandwich model and Fluid Mosaic Model, Osmosis, Passive and Active transport (Sodium Potassium ion pump), Exocytosis, Endocytosis (Pinocytosis & Phagocytosis)
- Unit 2:** (12 Periods)
Nucleus- Occurrence, Position and Morphology, Ultrastructure, Composition and functions of Nuclear membrane, Nuclear pore complex, Nucleolus-Structure and Functions
Chromosome-Structure and types, Nucleosome model
Giant Chromosome- Lampbrush and Polytene Chromosome
- Unit 3:** (12 Periods)
Mitochondria- Ultrastructure, Electron transport mechanism and Oxidative Phosphorylation,
Endoplasmic reticulum-Structure, Type and Function
Golgi Complex-Structure and Function
- Unit 4:** (12 Periods)
Lysosome-Structure,Function and Polymorphism
Ribosome-Structure (Lake's Model),types, Biogenesis of ribosome, Function and Polyribosome
Cell cycle,Mitosis, Meiosis, Significance.


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M.Sc. (Zoology)

Semester-III

Paper-X, Special Group-Aquaculture-I Fresh water Aquaculture

(CREDIT - 4)

Unit-I

- 1.1 Aquaculture: Definition, importance and present status in India.
- 1.2 Physicochemical conditions of pond water.
- 1.3 Biological conditions – Aquatic vegetation. Association of macro vegetation.
- 1.4 Plankton: Seasonal distribution, Diurnal movement and its role in fisheries.

Unit-II

- 2.1 Pond soil, Chemical conditions.
- 2.2 Pond ecosystem: Trophic level, food chain and food web in pond.
- 2.3 Methods of productivity measurement.
- 2.4 Planning and construction of fresh water fish farm.

Unit-III

- 3.1 Biology of culturable indigenous carps.
- 3.2 Biology of culturable exotic carps.
- 3.3 Reproductive system and breeding behavior in Indian carps.
- 3.4 Fisheries of major river systems in India.

Unit-IV

- 4.1 Reverine collection of fish seed.
- 4.2 Fish breeding in wet and dry bundhs.
- 4.3 Induced breeding by hypophysation.
- 4.4 Hatching techniques and types of hatcheries.

Semester –III

Paper-XI, Special Group-Aquaculture-II Aquaculture and Rural Development

(CREDIT - 4)

Unit-I


- 1.1 Culture of zooplankton
- 1.2 Prawn culture & Methods of breeding
- 1.3 Culture of crabs
- 1.4 Pearl culture / Oyster culture

Unit-II


- 2.1 Development and advancement of aquaculture in India.
- 2.2 Larvivorous fishes in relation to public health.
- 2.3 Culture of Exotic and transplanted fishes
- 2.4 Breeding and care of fresh water aquarium fishes.

Unit-III

- 3.1 Definition of economics and application of economic principles to aquaculture.


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| Microbiology B. Sc. I Semester-I(CBCS) | | |
|---|--|------------|
| Course Code –USMBT1 | | Marks - 50 |
| Credit : 2 | | Paper - I |
| FUNDAMENTALS OF MICROBIOLOGY | | |
| Unit No. | Content | Hrs. |
| 1 | History and Development of Microbiology | 12 |
| | Introduction to Microbiology, Branches of Microbiology, Scope of Microbiology Development of Microbiology as a discipline with special reference to the work of following scientists: Antony Van Leeuwenhoek, Louis Pasteur, Robert Koch, Martinus Beijerinck, Sergei Winogradsky, Alexander Flemming, Selman Waksman, A.M. Chakraborty, H.G. Khorana Theory of Abiogenesis and Biogenesis: Aristotle's notion about spontaneous generation, John Needham experiment Biogenesis: Experiments of F. Redi, Spallanzani, Schulze and Schwann, Schroder and Von Dusch, Louis Pasteur and John Tyndall | |
| 2 | Study of Prokaryotic Cell | 12 |
| | Difference between Eukaryotic and Prokaryotic cell. Structure and functions of bacterial cell components: (a) Cell wall (b) Cytoplasmic membrane (fluid Mosaic model (c) Capsule & Slime layer (d) Flagella (e) Nuclear material (f) Plasmids (g) 70 S Ribosome Endospore: Structure, Stages in Sporulation | |
| 3 | Microbial Taxonomy | 12 |
| | Aim, Principles and Parts of Taxonomy: General Criteria used for bacterial classification, concept of taxa, Genus, Species, Strain, Family, Order, Division, Kingdom; Various approaches of bacterial taxonomy: (Artificial, Natural & Evolutionary) Two (Linnean), Three (Haeckel), four (Stanier-Van Niel) and Five kingdom (Whittaker) concept. Methods of classification of bacteria: Intuitive method, Numerical taxonomy and Genetic relatedness (DNA base composition, DNA homology, r-RNA homology & sequencing methods). Bergey's Manual of Determinative and Systematic Bacteriology. | |
| 4 | Viruses, Archaeobacteria and Fungi | 12 |
| | Viruses - 1. General characteristics of viruses. 2. Structure of viruses. 3. Lytic Cycle of T4 Phage. 4. Lysogenic cycle of Lambda phage 5. Classification of Viruses: LHT classification. 6. Methods of cultivation of animal viruses. | |
| | Archaeobacteria: General characteristics, Unique characters. Groups of Archaeobacteria (Methanogens, Halophiles, Thermophiles). | |
| | Fungi: General characteristics, Methods of reproduction of Molds and Yeasts. | |


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| Microbiology B. Sc. I Semester-II(CBCS) | | |
|---|--|-----------------------------|
| Course Code – USMBT04 | | Marks - 50 |
| Credits: 2 | | Total Hours : 48 |
| USMBT05 | | APPLIED MICROBIOLOGY |
| Objective: To make the students to understand and aware the fundamentals of National Mission on Environmental cleanliness, health and hygiene. | | |
| Unit No. | Content | Hrs. |
| 1 | Air Microbiology: a. Definition and composition of air. b. Sources of microorganisms in air. c. Enumeration of microorganisms in air: Solid and liquid impingement technique (Lemons sampler, Anderson sampler) d. Room sterilization techniques (Radiation, Fumigation, Laminar air flow) e. Droplet, Aerosol, Droplet nuclei and Droplet infection, Air borne diseases (List with causative organisms) | 12 |
| 2 | Water Microbiology: a. Indicators of excretal pollution. b. Collection and handling of water sample for analysis c. Bacteriological analysis of water for coliforms(MTDT, MPN) d. Identification of faecal and non-faecal coliforms by (IMViC and Eijkmann test) e. Chlorination of water (mechanism), Different methods of Chlorination f. Water borne diseases(List with causative organisms) | 12 |
| 3 | Sewage Microbiology a. Definition and Types of Sewage, Composition and strength of sewage (BOD, COD, ThOD) b. Microbiology of sewage. c. General Flow Sheet of Waste Water Treatment d. Preliminary, Primary and Secondary sewage treatment methods. (Screening, Grit Removal, Septic Tank , Imhoff Tank, Trickling Filter, Activated Sludge, Oxidation Pond, Rotating Biological Contactor) | 12 |
| 4 | Milk Microbiology a. Definition and composition of milk, sources of contamination of milk. b. Desirable and undesirable changes in milk. c. Milk borne diseases (List with causative organisms). d. Bacteriological examination of milk by SPC, DMC, Reductase test (MBRT), checking of pasteurization of milk by phosphatase test. e. Milk products- Cheese, Yoghurt (production) | 12 |

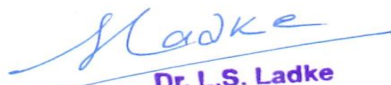

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| Microbiology B. Sc. II Semester-III (CBCS) | | |
|--|---|-----------------|
| Course Code -USMBT06 | Paper-II | Marks: 50 |
| Credits: 2 | | Total Hours :48 |
| FOOD, SOIL MICROBIOLOGY AND MICROBIAL ECOLOGY | | |
| Objective: To make the students to understand the fundamentals of Food, Soil and Microbial Ecology. | | |
| Unit No. | Content | Hrs |
| 1 | Food Microbiology | 12 |
| | a) Definition and types of food, Sources of contamination in food b) Microbial examinations of food c) Spoilage and its types (Different types of spoilages with suitable examples) d) Preservation of food (Physical, chemical and biological methods) e) Food borne diseases, food infections and food poisoning (Botulism, <i>Staphylococcal</i> intoxication and Salmonellosis) f) Concept of HACCP | |
| 2 | Soil Microbiology | 12 |
| | a) Composition of soil, Types of soil b) Humus Formation (Nature and Characteristics) c) Compost : Aerobic and anaerobic methods of composting d) Elemental transformations: Carbon cycle; Nitrogen cycle; Phosphorous cycle | |
| 3 | Microbial Association and Nitrogen Fixation | 12 |
| | a) Positive and Negative Microbial associations with examples Symbiosis, Syntrophism, Synergism, Commensalism, Parasitism, Competition, Antibiosis. b) Biological Nitrogen fixation - Nitrogen fixing bacteria, Symbiotic and non-symbiotic nitrogen fixation(in detail), Process of nodulation in legume, Nitrogenase complex, Nif gene. c) Biofertilizers and Biopesticides | |
| 4 | Environmental Biotechnology | 12 |
| | a) Microbial leaching - Bioleaching of Copper and Uranium. b) Microbial enhanced oil recovery (MEOR). c) Bioremediation, Acid mine drainage, Desulfurization of coal d) Biogas plant, construction and working mechanism e) Biodegradation of Pesticides (Xenobiotic) | |


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B.Sc. Sem IV

| Course Code – USMBT07 | Paper-I | Marks: 50 |
|---|--|------------------------|
| Credits: 2 | INDUSTRIAL MICROBIOLOGY | Total Hours :48 |
| Objective: To make the students to understand the fundamentals of Industrial processes and mechanisms for the product formation. | | |
| Unit No. | Content | Hrs |
| 1 | <p>Basics of Industrial Microbiology</p> <p>Definition, Scope and Development of Industrial Microbiology, Bioreactor / Fermentor (Definition, Characteristics of Ideal, General design and Different parts of typical Fermentor). Antifoaming agents.</p> <p>Fermentations: Definition and Types- Batch and Continuous (comparison), Solid and Liquid state, Surface culture and Submerged culture, Single, Dual / Multiple culture.</p> <p>Types of Fermentor: Continuous Stirred Tank Fermentor, Bubble Column reactors, Air Lift Fermentor Tower fermenter, Fluidized Bed Fermentor, Packed bed reactors (In Brief)</p> | 12 |
| 2 | <p>Fermentation Media and Microbes in Industrial Microbiology</p> <p>A) Commonly used raw materials for the fermentation process with composition: Saccharine materials (Cane and beet molasses, Fruit juices, Cheese whey), Starchy materials (Cereals and root tubers), Cellulosic materials (Sulphite waste liquor), Nitrogenous materials (Corn steep liquor, Soybean meal, Pharmamedia, Distillers soluble), Precursors</p> <p>B). Industrially important microorganisms & their products (List)</p> <p>C) Upstream Process: Primary and Secondary screening, Strain improvement, Inoculum build up, Scale up of fermentation process, Tolerance studies.</p> | 12 |
| 3 | <p>Downstream Processing</p> <p>Downstream process</p> <ul style="list-style-type: none"> . Cell mass removal by precipitation, filtration & centrifugation . Cell disruption by physical & chemical methods . Solvent recovery process . Chromatographic separation and industrial product recovery . Drying & crystallization. Quality testing of end product. . Packaging and marketing of product | 12 |
| 4 | <p>Production of Important Fermentation products</p> <p>Industrial production, Fermentation media, Microbes involved, Biochemistry, fermentation conditions, Product recovery operations and Uses of..</p> <ul style="list-style-type: none"> • Biomass – Baker's Yeast • Beverages –Wine (Production of Wine) • Antibiotics(Penicillin) • Organic acid (Citric acid) • Amino acids(Lysine) • Enzymes (Amylase) | 12 |


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GONDWANA UNIVERSITY, GADCHIROLI

SYLLABUS

For

B. Sc.

BOTANY

Semester I & II

Under

**Choice Based Credit System
(CBCS)**

(With effect from: 2020-21)

| SEMESTER - I | | | | |
|---|--|----------|-----------------|-------------|
| Papers | Title of the Paper | Th/Pr | Int. Assessment | Total Marks |
| Paper - I | Plant Diversity I (Micro-organisms, Algae, Fungi & Plant Pathology) | 50 Marks | 10 Marks | 60 Marks |
| Paper - II | Plant Diversity II (Bryophyta, Pteridophyta, Gymnosperm & Paleobotany) | 50 Marks | 10 Marks | 60 Marks |
| Practical | Based on Theory Paper - I & II of Semester - I | 30 Marks | --- | 30 Marks |
| Internal Assessment: Based on Assignment, Seminar, Unit Test & overall attendance and performance of the student. | | | | |

| SEMESTER - II | | | | |
|---|---|----------|-----------------|-------------|
| Papers | Title of the Paper | Th/Pr | Int. Assessment | Total Marks |
| Paper - I | Morphology and Anatomy of Angiosperms | 50 Marks | 10 Marks | 60 Marks |
| Paper - II | Taxonomy & Diversity of Angiosperms | 50 Marks | 10 Marks | 60 Marks |
| Practical | Based on Theory Paper - I & II of Semester - II | 30 Marks | --- | 30 Marks |
| Internal Assessment: Based on Assignment, Seminar, Unit Test & overall attendance and performance of the student. | | | | |


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SYLLABUS FOR B. SC. BOTANY SEMESTER I & II Under (CBCS) 2020-21

B.Sc. SEMESTER – I
Paper – I
Plant Diversity- I
(Micro-organisms, Algae, Fungi and Plant Pathology)
(48 Periods)

UNIT – I

(12 Periods)

1. **General characteristics of life** (Growth, metabolism and reproduction).
2. **Viruses:**
 - a) General characteristics and nature of viruses (living and non-living).
 - b) Morphology and Structure of T4 phage (DNA virus) and TMV (RNA virus).
 - c) Transmission of viruses in plants w.r.t. Grafting, Seeds, Contact, Air and water, Soil, Agricultural tools, Smokers, Store house and Insects.
3. **Mycoplasma:**
General characteristics and Structure.
4. **Bacteria:**
 - a) Structure of bacterial cell.
 - b) **Morphology of bacteria** (Bacillus, Coccus, Spirillum and Vibrio).
 - c) **Economic importance :** i) **Useful bacteria** (Agriculture, Industries and Medicine)
ii) **Harmful bacteria** (Pathogenic bacteria, Food spoiling, Food poisoning and Denitrification).

UNIT – II

(12 Periods)

Algae

1. **General Characters.**
2. **Habitats:** Aquatic, Terrestrial and Algae unusual habitats.
3. **Range of thallus structure in algae:** Unicellular, Colonial, Filamentous, Siphonaceous and Parenchymatous.
4. **Reproduction:** Vegetative, Asexual and Sexual.
5. **Classification** -G. M. Smith (1955) up to classes.
6. **Study of life cycle** w.r.t. Systematic position, thallus structure and reproduction of
 - a) *Nostoc* and
 - b) *Chara*.
7. **Economic importance** w.r.t. Agriculture, Industries, Medicine and Energy production.


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SYLLABUS FOR B. SC. BOTANY SEMESTER I & II Under (CBCS) 2020-21

UNIT – III:

(12 Periods)

Fungi

1. General Characters.
2. Thallus structure.
3. Mode of nutrition (Parasites, Saprophytes and Symbionts).
4. Reproduction: Vegetative, Asexual and Sexual.
5. Classification of Fungi - according to G. Ainsworth (1973) upto classes.
6. Study of life cycle w. r. t. Systematic position, thallus structure reproduction of
 - a) *Mucor* and
 - b) *Puccinia*.
7. Economic importance w. r. t. Agriculture, Industries, Food and Medicine.

UNIT – IV

(12 Periods)

1. Lichens:


- a) Definition and General Characters.
- b) Types - Crustose, Foliose and Fruticose.
- c) Ecological importance and Economical importance w.r.t. Agriculture, Industries, Food and Medicine.

2. Plant Pathology:

- a) Classification of plant diseases based on pathogens (viral, bacterial and fungal).
- b) Plant diseases caused by –
 - i. Viruses-w.r.t. Leaf curl of Papaya (Symptoms, Causal organism and Control measures).
 - ii. Bacterial- Bacterial blight of cotton (Symptoms, Causal organism and Control measures).
 - iii. Fungal- Red rot of Sugarcane (Symptoms, Causal organism- *Colletotrichum falcatum* and Control measures).

- Note: Developmental stages not expected.

Note: Student activates like seminars, quiz, debate, assignments, field work, study Project and models etc. are part of curriculum for all units.


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SYLLABUS FOR B. SC. BOTANY SEMESTER I & II Under (CBCS) 2020-21

SEMESTER – I
Paper – II
Plant Diversity- II
(Bryophyta, Pteridophyta, Gymnosperm and Paleobotany)
(48 Periods)

UNIT – I

(12 Periods)

Bryophyta

1. **General characteristics** w.r.t. Habit, Habitat, Gametophytes, Reproduction and Sporophyte.
2. **Adaptations to land habit.**
3. **Range of thallus organization** w.r.t. Morphology and Anatomy.
4. **Classification as per G. M. Smith** (up to order).
5. **Morphology, reproduction and life cycle of following type.**
 - a) *Riccia* (Hepaticopsida) and
 - b) *Funaria* (Bryopsida)
6. **Economic importance** w.r.t. Formation of peat, Packing material, Bedding stock, Medicines, in experimental botany, Food and Source of fuel.

UNIT – II

(12 Periods)

Pteridophytes

1. **General characteristics** w.r.t. Habit, Habitat, Sporophyte and Reproduction.
2. **Classification of Pteridophytes** according to **G. M. Smith (1955)** upto classes.
3. **Study of early land plant- *Rhynia*** w.r.t. Systematic position and Morphology.
4. **Morphology, anatomy, reproduction and life cycle of following type.**
 - a) *Equisetum* and
 - b) *Marsilea*
5. **Types of stele.**
6. **Ecological and Economical importance** w.r.t. Food, Soil binding, Scouring, Nitrogen fixation, Medicines, Ornaments etc.

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SYLLABUS FOR B. SC. BOTANY SEMESTER I & II Under (CBCS) 2020-21

B.Sc. SEMESTER – III

Paper – I

(48 Periods)

Reproductive Biology of Angiosperms, Plant Growth and Development

UNIT – I: (12 Periods)

1. Structure of Stamen, Microsporogenesis and Male gametophyte.
2. Structure of Pistil, Megasporogenesis and Female gametophyte (*Polygonum* type).
3. Types of Embryo sac (Mono, bi and tetrasporic).
4. Structure and types of Ovules.
5. Pollination: Types, Contrivances of self and cross pollinations, Attractions and Rewards.

UNIT – II: (12 Periods)

1. **Double fertilization and Triple fusion**
2. **Seed:**Endosperm and its types, Embryo and its types, Development of Dicot embryo (Onagrad type).
3. **Significance of seed:** Ecological adaptations
Seed dormancy: Suspended animation, causes and role of dormancy, methods to break seed dormancy.
Seed dispersal strategies.

UNIT – III (12 Periods)

1. **Growth and Development:**Definition, phases of growth and development.
2. **Plant Growth Regulators:** Introduction and Role of Auxin, Cytokinin, Gibberelin, Abscisic acid and Ethylene
3. **Plant Movements:** Tropic and Nastic Movements.

UNIT – IV: (12 Periods)

1. **Photoperiodism:** Concept, Short-day plants, Long-day plants, Day-neutral plants.
2. **Physiology of flowering:** Concept of florigen, Vernalization.
3. **Phytochromes:** Pr and Pfr forms, Circadian rhythm (Biological clock) Process and significance.
4. **Senescence and Abscission:** Definition and general account.


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Biology

B.Sc. SEMESTER – III

Paper – II

(48 Periods)

Plant Biochemistry and Physiology

UNIT – I:

(12 Periods)

1. Carbohydrates: Definition, properties and role, Aldoses and Ketoses; Structure of monosaccharides (glucose), disaccharides (sucrose), polysaccharides (cellulose and starch).
2. Lipid: Definition, properties and role; structure and uses of fatty acids, oils and waxes, phospholipids, sphingolipids, sterols.
3. Proteins: Structure and classification of amino acids, peptide bond and primary structure of protein.

UNIT – II:


(12 Periods)

1. **Basics of Enzymology:** Nomenclature (IUB system), Characteristics and properties of enzymes, Holoenzyme, Apo-enzyme, Co-enzyme and Co-factors, Regulation of Enzyme Activity (Enzyme-Substrate Complex Theory), Mechanism of Action (Lock and Key Model, Induced Fit Model).
2. Nitrogen Metabolism: Sources of Nitrogen to plants, Biological Nitrogen Fixation (Mechanism of Root Nodule formation), Importance of Nitrate Reductase.
3. Mineral Nutrition: Role and deficiency symptoms of macro (N, P, K, S, Ca, Mg) and micro (Cu, Fe, Zn, Mn, Mo) –nutrients.

UNIT – III:

(12 Periods)

1. **Plant Water Relations:** Properties of water, diffusion, osmosis and plasmolysis, water potential.
2. **Ascent of sap:** Water conduction through xylem, Root pressure theory, Cohesion-Adhesion theory.
3. **Transpiration:** Definition, types, Stomatal opening and closing mechanisms(K and malate theory), significance, guttation.
4. **Phloem transport:** Bulk flow theory (Munch hypothesis).
5. Theories of absorption of solute in plants: Active absorption (Carrier concept), Passive absorption (Ion exchange theory and Donnan Equilibrium theory).


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**Scheme for Choice Based Credit System for B.Sc. Programme in
BOTANY**

| Semester | Core Course 6 Credits | Ability Enhancement Compulsory Course (2+2= 4 credits) | Skill Enhancement Courses SEC 2 Credits | Discipline Specific Elective DSE 6 Credits |
|--------------|--------------------------|--|--|--|
| SEM-V | | | <p>SEC-III</p> <p><u>Any One SEC</u> is to be chosen from the pool of SEC of Core Subjects selected by the student</p> <ol style="list-style-type: none"> 1. Gardener Training - (Basic) 2. Mushroom Culture Technology 3. Herbal Technology 4. High Density Planting 5. Floriculture <p>PRACTICAL</p> <p>(70% part of the SEC is Practical)</p> | <p>DSE I</p> <p><u>Two papers of any one DSE</u> are to be chosen by the student from Three Options given below.</p> <p>Option-1 Paper-I: Genetics and Plant Breeding - I</p> <p>Paper II: Genetics and Plant Breeding - II</p> <p>Option-2 Paper-I: Molecular Biology - I</p> <p>Paper II: Molecular Biology - II</p> <p>Option-3 Paper-I: Economic Botany- I</p> <p>Paper II: Economic Botany- II</p> <p>PRACTICAL</p> <p>Based on paper I and II of DSE selected by the student from the above mentioned Options-1, 2 and 3 of Semester-V.</p> |

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B.Sc. Botany

SEMESTER – V:

Discipline Specific Elective-I (DSE-I)

NOTE: Student has to select any ONE from the three Options under DSE-I category.

| Papers | Title of the Paper | Theory / Practical | Internal Assessment | Total Marks |
|---|--|--------------------|---------------------|-------------|
| Option-1 | | | | |
| Paper – I | Genetics and Plant Breeding – I | 50 Marks | 10 Marks | 60 Marks |
| Paper - II | Genetics and Plant Breeding – II | 50 Marks | 10 Marks | 60 Marks |
| Option-2 | | | | |
| Paper – I | Molecular Biology - I | 50 Marks | 10 Marks | 60 Marks |
| Paper -II | Molecular Biology - II | 50 Marks | 10 Marks | 60 Marks |
| Option-3 | | | | |
| Paper –I | Economic Botany- I | 50 Marks | 10 Marks | 60 Marks |
| Paper –II | Economic Botany- II | 50 Marks | 10 Marks | 60 Marks |
| Practical – V | Based on two papers of DSE – I selected by the student from the above mentioned Options- 1, 2 and 3 of Semester –V | 30 Marks | -- | 30 Marks |
| Internal Assessment: Based on Assignment, Seminar, Unit Test & Overall Attendance and Performance of the Student. | | | | |

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2. Types of sadhetu
3. Types of Hetvabhas
4. Vyptigrahopaya

Foundation Course
Philosophy
SEMESTER II
Western Logic



UNIT I

1. Nature, Scope, Definition of Western Logic
25 Marks
2. Classification of term
3. Classification of Proposition
4. Cannotation and denotation

UNIT II

1. Quantitative and Quatitative propostion
25 Marks
2. Square of opposition of proposition
3. Conversion
4. Obsersion


B.A.Sociology (CBCS)

1-Indian Society

Semester - II

Foundation Course

- I. Sociological pesspeetines of the study of Indian Society.
 - A) Marxist Perspective


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- B) Structural-functional Perspective
- C) Substratist perspective
- D) Indological perspective

II. **The Composition of Indian Society.**

- A) Tribal Community
- B) Rural Community
- C) Urban Community

III. **Racial, Religious and Linguistic Composition of Indian Society.**

- A) Population of India
- B) Racial Composition
- C) Religious composition
- D) Linguistic Composition

IV. **Unity and diversity in Indian Society.**

- A) Diversity in Indian Society
 - Racial, Religious, Linguistic and Cultural
- B) Unity in Indian Society
 - Geographical, political, Language, Cultural, Religious.

B.A.Sociology (CBCS)

2-Social Problem

Semester - II

Foundation Course

- I. A) Fallacies about social Problems.



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Semester – I

- ❖ **Unit – I - Understanding Sociology .**
 - The origin and development of Sociology.
 - Definition of Sociology
 - Sociology as a Science
 - Nature & Scope of Sociology
 - Subject matter of Sociology
 - Sociology & its relationship with political Science and Economics
 - Importance of Sociology
- ❖ **Unit – II - Basic Concepts**
 - Society – Meaning and characteristics
 - Social Group – meaning & Characteristics of Social group
 - Types of Social group – Primary group, Secondary group
 - Characteristics & Importance of Primary & Secondary group
 - Merton's theory of Reference group
 - Social Structure – Meaning and elements of Social Structure
 - Social Status – Meaning and types.
- ❖ **Unit – III - Institutions**
 - Meaning and Characteristics
 - Family – Definition, characteristics, types, recent Changes in the Functions of Family
 - Marriage – Meaning, Aims of marriage, Characteristics, types of marriage, Changing nature of marriage.
 - Religion – Meaning & basic Characteristics, Functions of religion.
- ❖ **Unit – IV – Culture and Socialization**
 - Definition
 - Types of Culture
 - Characteristics of culture
 - Elements of Culture
 - Socialization - meaning of Socialization –Aims of Socialization
 - Stages of Socialization
 - Agencies of Socialization
 - Importance of Socialization

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