Criterion 1 – Curricular Aspects

Key Indicator – 1.3 Curriculum Enrichment

QlM – 1.3.1 **Institution integrates crosscutting issues relevant to Professional Ethics, Gender, Human Values, Environment and Sustainability in transacting the Curriculum**

INDEX

- Syllabus of subjects showing crosscutting issue
- Link of Activities conducted regarding cross-cutting issue

VSPM Academy of Higher Education

ARVINDBABU DESHMUKH MAHAVIDYALAYA

BHARSINGI, Dist. Nagpur - 441305

NAAC Re-accredited with 'B++' Grade (CGPA 2.81)

Prakash Pawar
Principal

Ref.No. ADM/2023-24/115 Date 21/10/23

This is to declare that the data provided in this file in the form of information, supporting documents, numerical data, and reports are verified by the IQAC and Principal and found correct.

Co-ordinator
IQAC
Arvindbabu Deshmukh
Mahavidyalaya, Bharsingi

PRINCIPAL
ARVINDBABU DESHMUKH MAHAVIDYALAYA
BHARSINGI, DIST. NAGPUR

NOTIFICATION

No. 2.

Dated 27 February, 2007

It is notified for general information of all the concerned that the Hon'ble Vice-Chancellor has approved under Section 14(7) of the Maharashtra University Act, 1994 on behalf of Academic Council accepting the syllabus for compulsory course of six month duration in Environment Studies at under graduate course of all branches and faculties of higher education on the guidelines of already accepted and approved pattern of UGC model to be implemented for the session 2007-2008.

Encl:- Syllabus

Registrar,
Rashtrasant Tukadoji Maharaj
Nagpur University, Nagpur.

No. Acad./1437.

Nagpur Dated 27th Feb., 2007

Copy forwarded for information and necessary action to:-

1. All Principals/Directors of all colleges affiliated to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur.
2. All the Deans of the Faculties, Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur
3. The Controller of Examinations,
4. The Deputy Registrar (Exams.)
5. The Asstt. Registrar (Prof..Exams)/(Exams.) /(Confidential/Exams. & Enqr.)
6. The Asstt. Registrar (University Sub-Centre), Gadchiroli
7. The P. A. to the Hon'ble Vice Chancellor,
8. The P. A. to Hon'ble Pro-Vice Chancellor,
9. The P. A. to the Registrar,

Rashtrasant Tukadoji Maharaj
Nagpur University, Nagpur

(Ar. Vilas Ramteke)
Deputy Registrar (Acad.)
Rashtrasant Tukadoji Maharaj
Nagpur University, Nagpur

Principal
Arvindbabu Deshmukh Mahavidyalaya

Unit I : Introduction (2)

Definition, scope and importance; Need for public awareness - institutions in environment, people in environment.

Unit II : Natural Resources (2)

Renewable and non-renewable and associated problems; Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

Unit III : Ecosystems (8)

Concept of an ecosystem – understanding ecosystems, ecosystem degradation, resource utilization.

Structure and functions of an ecosystem – producers, consumers and decomposers.

Energy flow in the ecosystem – water, carbon, oxygen, nitrogen and energy cycles, integration of cycles in nature.

Ecological succession; Food chains, food webs and ecological pyramids; Ecosystem types – characteristic features, structure and functions of forest, grassland, desert and aquatic ecosystems.

Unit IV : Bio-diversity (10)

Introduction – biodiversity at genetic, species and ecosystem levels

Bio-geographic classification of India

Value of biodiversity – Consumptive use value, productive use value, social, ethical, moral, aesthetic and optional value of biodiversity.

India as a mega-diversity nation; hotspots of biodiversity

Threats to bio-diversity – habitat loss, poaching of wildlife, man-wild life conflicts.

Common endangered and endemic plant and animal species of India.

Insitu and Exsitu conservation of biodiversity

Unit V : Pollution (6)

Definition; Causes, effects and control measures of air, water, soil, marine, noise and thermal pollutions and nuclear hazards.

Solid waste management – Causes, effects and control measures of urban and industrial waste.

Unsustainable ... rainwater ... rehabilitati... to energy; Water conservation, management; Problems and concerns of resettlement and affected people.

Environmental ethics – issues and possible solutions – Reso... consumption patterns and need for equitable utilization; Equity dispar... Western and Eastern countries; Urban and rural equity issues; need... gender equity.

Preserving resources for future generations. The rights of anim... Ethical basis of environment education and awareness; Conservation et... and traditional value systems of India.

Climate change, global warming, acid rain, Ozone layer deple... nuclear accidents and holocasts.

Wasteland Reclamation; Consumerism and Waste products.

Environment legislations –The Environment (protection) Act; ... water (Prevention and Control of Pollution) Act; The Wildlife Protection ... Forest Conservation Act; Issues involved in enforcement of environme... legislations – environment impact assessment (EIA), Citizens actions ... action groups.

Public awareness – Using an environmental calendar of activities, ... initiation.

Unit VII : Human Population and the Environment (10)

Global population growth, variation among nations. Popula... explosion; Family Welfare Programmes – methods of sterilizat... Urbanization.

Environment and human health – Climate and health, infecti... diseases, water-related diseases, risk due to chemicals in food, Cancer ... environment.

Human rights – Equity, Nutrition and health rights, Intellect... property rights (IPRS), Community Biodiversity registers (CBRs).

Value education – environmental values, valuing nature, valu... cultures, social justice, human heritage, equitable use of resour... common property resources, ecological degradation.

HIV/AIDS; Women and Child Welfare; Information technology ... environment and human health.

*(Number of lectures suggested)

Scope and depth of each unit taught would be as per U... Publication "a Text Book of Environmental Studies for Undergradu... Courses by Erach Bharucha", published by Universities Press (In... Pvt.Ltd., Hyderabad – 500 029..

Students be exposed to atleast 4 local field ... observations on the Ecosy...

75 marks ... for objective type questions covering various aspects of the syllabus ...ould carry (50 questions, each of one mark) and 25 marks for one essay type question.

At the end of the course the student would be evaluated for 100 marks with distribution as below –

Field note book	-	25
Objective Questions	-	50
Essay type question	-	25
Passing marks	-	40

The result would be declared in grades –

Grade O : above 75; A : 61-75; B : 51-60; C : 40-50

II A fee of Rs.100/- per student be charged and its utilization is as : Rs.20/- will be sent to the university and Rs.16/- to Principal to be utilized for infrastructure and administrative expenses pertinent to the course. However the final fee structure may be decided by the appropriate authority of the University.

III The Principal would appoint Coordinator and Assistant Coordinator as per need to coordinate the teaching of the course, appoint contributory teachers, if necessary. At the end of the course, the college would conduct the examination. It will appoint paper setters and examiners. The final grades of candidates should be informed to the university. The expenditure for all the required manpower be met from the remaining amount of fees.

IV Qualifications of a Teacher : A teacher in any subject possessing knowledge to teach the "Course on Environmental Studies" shall be eligible.

The course should be taught in second year and can be cleared in third year in case the student remains absent or fails to clear the course.

The candidate will have to pass in the examination of this course in order to obtain degree certificate from the University.

OR & batch of 20,

In view of entire course the student may be assigned a project work encompassing Community/Biodiversity Register (CBR) of any Gram-Panchyat as per format of ~~National~~ Biodiversity Authority of India under the guidance of a teacher. This CBR should be evaluated for 100 marks.

B.A.FIRST YEAR: SEMESTER – I
POLITICAL THEORY
PAPER-I
MARKS: 80

COURSE RATIONALE:

This is an introductory paper to the concepts, ideas and theories in political theory. It seeks to explain the evolution and usage of these concepts, ideas and theories with reference to individual thinkers both historically and analytically. The different ideological standpoints with regard to various concepts and theories are to be critically explained with the purpose of highlighting the difference in their perspectives and in order to understand their continuity and change. Furthermore there is a need to emphasize the continuing relevance of these concepts today and explain how in idea and theory of yester years gains prominence in contemporary political theory. All units have to be taught with Liberal and Marxist approaches.

COURSE LEARNING OUTCOMES:

After completing this course students will be able to:

- Understand the nature and relevance of Political Theory
- Understand different concepts i.e. power, authority, rights, liberty, equality and justice
- Understand present situation of concepts

COURSE CONTENT:

UNIT - I: POLITICAL THEORY AND STATE

(1) POLITICAL THEORY: Meaning, Nature, Scope and Significance

(2) STATE: Meaning, Nature and Basic Elements, Approaches: Liberal and Marxist.

UNIT- II: POWER AND AUTHORITY

(3) POWER: Meaning, Nature, Significance and Types

(4) AUTHORITY: Meaning, Nature, Significance and Types.

UNIT- III: LIBERTY AND EQUALITY

(5) LIBERTY: Meaning, Nature, Significance and Types.

(6) EQUALITY: Meaning, Nature and Significance and Type.

UNIT- IV: RIGHTS AND JUSTICE

(7) RIGHTS: Meaning, Nature, Types.

(8) JUSTICE: Meaning, Nature, Types, Distributive Justice, Feminist Perspective.

Principal
Arvindbabu Deshmukh Mahavidyalaya
Bhamragi

UNIT	TENTATIVE ALLOWTED PERIOD	ALLOWTED MARKS
I	20	20
II	20	20
III	18	20
IV	17	20
TOTAL ALLOTTED PERIODS	75	80
TOTAL CREDITS	04	

Teaching Scheme (Hours/Week)				Examination Scheme			Total	Minimum Passing Marks
L	T	P	Total	Duration in Hours	Maximum Marks			
					External Marks	Internal Marks		
05	--	--	05	3	80	20	100	40

Books Recommended:

1. Amaj Ray & Mohit Bhattacharya: Political theory and Institutions
2. Gauba O.P.: An Introduction to Political Theory, 2014
3. Sushila Ramaswami: Political Theory: Ideas and Concepts, 2010.
4. Sushila Ramaswami: Political Theory and Thought, 2010.
5. Sushila Ramaswami: Key Concepts in Political Theory, 2014.
6. ओमप्रकाश गाबाः राजनीति-सिद्धांत एवं चिंतन, राजनीति-सिंद्धांत के विवेच्य विषय.
7. गर्वइ जोगेन्द्र, हाशम शेख, राजकीय सिद्धांत, विश्व प्रकाशन नागपूर, 2013.
8. देशमुख अलकाः राजकीय सिद्धांत, साईनाथ प्रकाशन नागपूर, 2014.
९. काळे, अशोक, राजकीय सिद्धांत, विद्या प्रकाशन, नागपूर, 2007.
10. गणवीर राष्ट्रपाल, राजकीय सिद्धांत आणि राजकीय विचारवंत, सर साहित्य केंद्र नागपूर, २०१४

B. A. I: SEMESTER – II

WESTERN POLITICAL THOUGHT

Paper – II

Marks: 80

COURSE RATIONALE:

The paper on western political thought introduces the students to the classical ideas generated in the western world representation the ancient to the modern. The paper intends to introduce the thinkers broadly representing the individual and communitarian ideas. Four thinkers have been selected including Plato, Aristotle, J.S. Mill and Karl Marx who represent this spectrum. The paper deals with details the various aspects of the ideas of all these political thinkers.

COURSE LEARNING OUTCOMES:

This course will help students to:

- Understand fundamental concepts of Plato, Aristotle, Mill and Marx's philosophy
- Understand these concepts in a critical and analytical manner

COURSE CONTENT:

UNIT – I: PLATO

1. Theory of Justice
2. Ideal State
3. Theory of Communism
4. Philosopher King

UNIT – II: ARISTOTLE

1. Theory of State
2. Classification of State
3. Thoughts on Revolution
4. Slavery

RVB

B. A. SECOND YEAR:
SEMESTER – III
INDIAN GOVERNMENT AND POLITICS
PAPER-III
MARKS: 80

COURSE RATIONALE:

This paper focuses in detail on the political processes and the actual functioning of the political system. It simultaneously studies in detail the political structure both Constitutional and Administrative. It emphasizes on local influences that derive from social stratification of Castes and Jatis, from language, religious ethnic and economic determinants and critically assesses its impact on the political processes. The major contradictions of the Indian Political Process are to be critically analyzed along with an assessment of its relative success and failure in a comparative perspective with other developing countries and in particular those belonging to the South Asian region.

COURSE LEARNING OUTCOMES:

On successful completion of the course students shall be able to:

- Understand the Indian Constitution with its basic principles
- Know constitutional legal rights
- Understand different functionaries and their working established by the Constitution

COURSE CONTENT:

UNIT - I: INDIAN CONSTITUTION

(1) Preamble: Nature, Objectives of Constitution of India.

(2) Features of Indian Constitution.

UNIT- II: FUNDAMENTAL RIGHTS, DIRECTIVE PRINCIPLES OF STATE POLICY

(3) Fundamental Rights: Meaning, Kinds, Restrictions.

(4) Directive Principles of State Policy: Nature and Significance.

UNIT- III: PRESIDENT, PARLIAMENT AND PRIME MINISTER

(5) President: Powers and Functions.

(6) Parliament: Composition, Powers and Functions.

(7) Prime Minister: Powers and Functions.

UNIT- IV: SUPREME COURT AND MAJOR ISSUES IN INDIAN POLITICS

(8) Supreme Court: Composition, Powers and Jurisdiction, Judicial Review.

(9) Major Issues in Indian Politics: Caste, Religion and Terrorism.

B. A. III YEAR: SEMESTER-VI
INTERNATIONAL RELATIONS
PAPER-VI
MARKS: 80

COURSE RATIONALE:

This paper deals with concepts and dimensions of international relations and makes an analysis of different theories highlighting the major debates and differences within the different theoretical paradigms. The dominant theories of power and the question of equity and justice, the different aspects of balance of power leading to the present situation of a unipolar world are included. It highlights various aspects of conflict and conflict resolution on through collective security and the role of UN.

COURSE LEARNING OUTCOMES:

- Students shall learn history and major theoretical approaches in International Relations.
- Course shall enhance students understanding conceptual international relations and reality.
- Students shall learn role of different international organisations maintaining peace.

COURSE CONTENT:

UNIT-I: - INTERNATIONAL RELATIONS AND THEORIES

A) International Relations:-Meaning, Nature and Significance.

B) Theories of International Relations: - i) Realist Theory and ii) Game theory

UNIT-II:- NATIONAL POWER AND FOREIGN POLICY

A) National Power:-Meaning, Nature and Elements.

B) Foreign Policy:-Meaning, Objectives and Determinants

UNIT-III:- BALANCE OF POWER AND COLLECTIVE SECURITY

B) Balance of Power:-Meaning, Types and Techniques.

C) Collective Security:-Meaning, Nature and Basic Principles

UNIT-IV: - GLOBAL TERRORISM AND HUMAN RIGHTS

A) Global Terrorism:-Meaning, Causes and Techniques.

B) Human Rights:-Meaning, Nature and Importance.

RTM NAGPUR UNIVERSITY, NAGPUR

Semester Pattern Syllabus with Skill Development

For B. Sc. Botany

DEPT. OF BOTANY 27/12/2019 B.S.C. SACHER

B. Sc. SEMESTER- I 2020-21 onwards

PAPER-I : Viruses, Prokaryotes, Algae and Biofertilizers
PAPER-II : Fungi, Plant-Pathology, Lichen, Bryophyta and Mushroom Cultivation

B. Sc. SEMESTER-II 2020-21 onwards

PAPER-I : Palaeobotany, Pteridophytes, Gymnosperms and Soil Analysis
PAPER-II : Morphology of Angiosperms and Floriculture

B. Sc. SEMESTER-III 2021-22 onwards

PAPER-I : Angiosperm Systematics, Embryology and Indoor Gardening
PAPER-II : Angiosperm Anatomy and Horticulture

B. Sc. SEMESTER-IV 2021-22 onwards

PAPER-I : Cell Biology, Plant Breeding, Evolution and Seed Technology
PAPER-II : Genetics, Molecular Biology and Plant Nursery

B. Sc. SEMESTER-V 2022-23 onwards

PAPER-I : Plant Physiology, Mineral Nutrition and Hydroponics
PAPER-II : Plant Ecology and Organic Farming

B. Sc. SEMESTER-VI 2023-23 onwards

PAPER-I : Biochemistry, Biotechnology and Herbal Technology
PAPER-II : Phytogeography, Utilization of plants, Techniques and Pharmacognosy

.....

25.2.19

25/02/19

Arvindbabu Deshmukh Mahavidyalaya Bharsingi

B. Sc. SEMESTER- I

PAPER-I

(Viruses, Prokaryotes, Algae and Biofertilizers)

Unit-I: Virus and Prokaryotes:

1. **Viruses:** Nature of viruses (Non-living and living characteristics), Ultra structure of TMV, Structure and multiplication of T-4 bacteriophage, Economic Importance of viruses.
2. **Mycoplasma:** Properties, Structure and Reproduction.
3. **Bacteria:** General characteristics, Ultrastructure of bacterial cell, Reproduction (Binary Fission and Conjugation), Economic importance of bacteria (with reference to their role In Agriculture and industry).

Unit-II: Cyanobacteria and Algae:

1. **Cyanobacteria:** Cell ultrastructure, Structure of heterocyst, Structure and Reproduction in *Nostoc*, Economic importance of Cyanobacteria.
2. **Algae:** General characteristics, Classification (Fritsch,1954), Economic importance of Algae.

Unit-III: Algae:

Life cycles in Algae: *Chara, Vaucheria, Ectocapus* and *Batrachospermum.*

Unit-IV: Skill Development: Biofertilizers:

1. **Biofertilizers:** Definition, scope and importance
2. Various microbes used as Biofertilizers
3. Commercial production of Biofertilizers: *Rhizobium, Azotobacter*, PSB (Phosphate Solubilizing Bacteria, e.g. *Bacillus polymyxa*) and *Azolla.*

List of Practical: Paper-I

1. Study of viruses from models/photographs (TMV and T4 bacteriophage).
2. Gram staining of Bacteria, ultra-structure of bacteriophage from TEM photographs.
3. Study of Cyanobacteria: *Nostoc*
4. Study of vegetative and reproductive structures in *Nostoc*
5. Study of Algal genera: *Chara, Vaucheria, Ectocarpus* and *Batrachospermum.*
6. Identification and characterization of *Rhizobium, Azotobacter*, PSB and *Azolla.*

B. Sc. SEMESTER- I
PAPER-II
(Fungi, Plant Pathology, Lichens, Bryophyta and Mushroom Cultivation)

Unit-I: Fungi:

1. **Fungi:** General characteristics, Classification (Alexopoulos, 1996), Economic importance.
2. Life history of *Albugo, Mucor, Puccinia* and *Cercospora.*

Unit-II: Plant Pathology and Lichens:

1. **Plant-Pathology:** Host, Pathogen, Symptoms, Causes and control of diseases: Leaf curl of Papaya, Citrus canker and red rot of Sugarcane
2. **Lichens:** Introduction, Types, Reproduction and Economic importance.

Unit-III: Bryophyta:

1. **Bryophyta:** General Characteristics, Classification (Proskauer, 1957), Economic importance.
2. Life history of *Marchantia, Anthoceros and Funaria.*

Unit-IV: Skill Development: Mushroom Cultivation:

1. **Introduction:** Nutritional and medicinal value of edible mushroom; Poisonous mushroom. Edible mushroom: *Volvariella volvacea, Plerotuscitrino pileatus, Agaricus bisporus.*
2. **Technology of Mushroom cultivation: Infrastructure:** Mushroom unit (Thatched house);**Tools:** Polythene bags, vessels, inoculation hook, inoculation loop, low cost stove, sieves, culture rack, water sprayer, tray, medium.
3. **Techniques:** Substrate, preparation of medium and spawn, sterilization, multiplication, bed preparation (Paddy-straw, sugarcane trash, banana leaves)

Note: 1. Developmental stages are not expected
2. Short excursion tour/visit to biofertilizer laboratory or Mushroom cultivation center is expected

List of practical: Paper-II:

1. Study of Fungal genera: *Albugo, Mucor, Puccinia, Cercospora*
2. Study of Lichen: Thallus structure, Types of lichens.
3. Plant pathology: Leaf curl of Papaya, Red rot of Sugarcane, Citrus canker
4. Study of Bryophytes: *Marchantia, Anthoceros, Funaria.*
5. To study different instruments/tools used in mushroom cultivation.
6. To study method of preparation of spawn.
7. To study preparation of mushroom beds

B. Sc. SEMESTER-II

PAPER-I

(Palaeobotany, Pteridophytes, Gymnosperms and Soil analysis)

Unit-I: Palaeobotany:

1. **Palaeobotany:** Definition; fossil and Pseudo-fossil, Importance of fossils.
2. **Types of fossils:** Compression, Impression, Cast-Mold, Petrification and Amber.
3. **Geological time scale:** Definition, Outline and brief account of Eras.
4. **Fossil leaf:** *Glossopteris*, **Fructification:** *Scutum*.

Unit-II: Pteridophytes:

1. **Pteridophyta:** General characteristics, Classification (Smith, 1952).
2. **Fossil Pteridophyte:** *Rhynia*
3. **Life history of:** *Selaginaella and Equisetum.*
4. Heterospory and seed habit.
5. Brief account of types of steles

Unit-III: Gymnosperms:

1. **Gymnosperms:** General characteristics, Classification (Steward, 1982), Economic Importance
2. **Fossil Gymnosperms:** *Cycadeoidea* flower
3. **Life cycle of:** *Cycas* and *Pinus*.

Unit-IV: Skill Development: Soil analysis:

1. **Soil:**Types of soil, method of collection of soil samples.
2. **Physical properties of soil:** Soil texture, soil colour, Water Holding Capacity (WHC), Water Rising Capacity (WRC), Bulk Density (BD) and Porosity (P).
4. **Chemical properties of soil:** pH, Carbonates as $CaCO_3$, Available Nitrogen, Available Phosphorous, Available Potassium.

List of Practical: Paper-I:

1. Fossils: Types (Compression, Impression, Cast-Mold, Petrifaction): *Glossopteris, Rhynia, Cycadeoidea.*
2. Study of Pteridophytes: *Selaginaella and Equisetum.*
3. Study of Gymnosperms: *Cycas and Pinus*
4. Types of soil
5. To study Physical properties of soil samples
6. To study Chemical properties of soil samples

B. Sc. SEMESTER-III

PAPER-I

(Angiosperm Systematics, Embryology and Indoor Gardening)

Unit-I: Systemic botany:

1. **Origin of Angiosperms:** (Benettitalean theory)
2. **Fossil angiosperms:** Flower (*Sahanianthus*); Fruit (*Enlgmocarpon*)
3. **Angiosperm Taxonomy:** Floras, Herbarium, Keys (Intended and Bracketed)
4. **Botanical Nomenclature:** Principles (Rank and taxon, Principle of priority)
5. **Modern trends in taxonomy:** Cytotaxonomy (Karyotype), Phytochemistry (Proteins and Flavenoids)

Unit-II: Angiosperm: Classification and Families:

1. **Systems of Classification**: Benthem and Hooker; Engler and Prantl (along with merits – demerits)
2. **Study of families: Dicot:** *Malvaceae, Brassicaceae, Papilionaceae, Asteraceae, Asclepiadaceae;* **Monocot:** *Poaceae.*

Unit-III: Embryology:

1. **Pollination:** Types and Significance.
2. **Anther:** T. S. Anther, Microsporogenesis; Structure of pollen grain, Development of male gametophyte.
3. **Ovule:** Types of ovule, Structure of anatropous ovule, Megasporogeneis, Development of female gametophyte (*Polygonum* type)
4. **Fertilization:** Double fertilization and triple fusion, Endosperm and its types, Structure of Dicot embryo (*Onagrad*) and Monocot embryo.

Unit-IV: Skill Development:Landscaping and Indoor gardening

1. **Landscaping:** Definition, scope of landscaping (Landscaping at offices, industrial premises, educational institutes and parks)
2. **Indoor gardening:** Brief account of places of house plants, pots and containers; Factors required for growing house plants (Temperature, light, humidity, ventilation, watering, soil, feeding, potting)
3. **Popular house plants: Foliage Plants**: *Coleus blumei, Begonia sp.*,**Ferns:** *Adiantum sp., Nephrolepis* sp., **Palms:** *Chrysalidocarpus lutescens*- Areca palm, *Howea forsteriana*- Kentia palm, **Flowering plant:** *Anthurium sp., Begonia* sp.,**Orchids:** *Vanda sp., Dendrobium* sp.

List of practical: Paper-I

1. Study of fossil Angiosperms from specimens/slides.
2. Study of dicot and monocot families mentioned in theory syllabus.
3. To calculate percent germination of pollen grains in the given material
4. Study of structure of anther and pollen grain.
5. Study of different types of ovule.
6. Study of dicot and monocot embryos from permanent micro-preparation.
7. Study of different popular house plants.

B. Sc. SEMESTER-III
PAPER-II
(Angiosperm Anatomy and Horticulture)

Unit-I: Anatomy:

1. **Tissue:** Definition, Characteristics of Meristematic tissue; Classification of meristems (based on origin and position).
2. **Simple Permanent Tissue and their functions**: Parenchyma, Collenchyma, and Sclerenchyma
3. **Complex Permanent Tissue and their functions:** Xylem and Phloem
4. **Apical meristem of root and shoot:** Apical cell theory, Histogen theory, Tunica-Corpus theory, Newman's theory
5. **Cambium:** Structure, Types and functions.

Unit-II: Primary and Secondary Growth in stem and root:

1. **Types of vascular bundles:** Radial, Conjoint, Concentric.
2. **Normal Primary structure of root:** Dicot (*Sunflower*) and Monocot (*Maize*)
3. **Normal Primary structure of stem:** Dicot (*Sunflower*) and Monocot (*Maize*)
4. **Normal secondary growth in dicot stem:** *Sunflower*
5. **Anomalous Secondary growth in:** Dicot stem (*Bignonia*) and Monocot stem (*Dracaena*)

Unit-III: Periderm, growth rings, Sap-heartwood, leaf anatomy:

1. **Growth rings**: Spring wood and winter wood
2. Sap wood, Heart wood, Tyloses
3. **Periderm:** Composition, functions and Structures associated with periderm (Lenticel, Bark, Commercial cork)
4. **Anatomy of leaf:** Dicot (*Nerium*) and Monocot (*Maize*)
5. Senescence and Abscission.

Unit-IV: Skill Development: Horticulture

1. **Horticulture:** Definition and scope; importance of horticulture, water requirement and irrigation, nutrient management.
2. Methods of propagation of following horticultural crops (propagation by seeds, vegetative propagation, propagation through specialized organs): Rose, *Chrysanthemum*, *Crotons*, Mango, Citrus, Guava, *Lilium*.
3. Technique of Bonsai preparation.

List of Practical: Paper-II:

1. Study of simple and complex tissue from permanent micro-preparation.
2. Study of different types of vascular bundles.
3. Study of internal structure of dicot and monocot roots with the help of temporary micro-preparation.
4. Anatomy of dicot and monocot stem with the help of temporary or double stained permanent micro-preparation.
5. Anatomy of normal and anomalous secondary growth in stem with the help of double stained permanent micro-preparation.
6. Study of internal structure of dicot (*Nerium*) and monocot leaf (Maize) with the help of temporary micro-preparation.
7. Study of various horticultural crops mentioned in syllabus.

Note: 1. Developmental stages are not expected

2 Short excursion tour is expected

B. Sc. SEMESTER-IV
PAPER-II
(Genetics, Molecular Biology and Plant Nursery)

Unit-I: Genetics: (Mendelism, Linkage and crossing over).

1. **Mendelism:** Basic terminology, Law of segregation and law of independent assortment.
2. **Interaction of genes:** Allelic: Incomplete dominance (1:2:1); Non-allelic: Complementary factors (9:7) and Dominant epistasis (12:3:1).
3. **Linkage:** Definition, Theory of linkage: Coupling and Repulsion, Types: Complete and Incomplete linkage
4. **Crossing over:** Definition, Breakage and reunion theory, significance of crossing over.

Unit-II: Genetics: (Mutation)

1. **Mutation:** Definition, Types:Spontaneous and induced mutation, Physical and Chemical mutagens, applications of induced mutations.
2. **Chromosomal aberrations:** Deficiency, Duplications, Inversion and Translocation
3. **Variation in chromosome number:** Aneuploidy (Nullisomics, Monosomics, Trisomics and Tetrasomics), Euploidy (Autopolyploidy, Allopolyploidy); Significance.
4. **DNA Damage and Repair:** Photoreactivation and Excision Repair

Unit-III: Molecular biology

1. DNA: Structure of DNA (Watson and Crick's model), Replication of DNA: Semiconservative method of DNA replication,
2. RNA: Types, Clover leaf model of t-RNA
3. **Concept of gene:** Classical: Cistron, Muton and Recon
4. **Genetic code:** Definition and characteristics
5. **Protein synthesis:** Transcription and Translation
6. **Regulation of gene action:** Lac-Operon model

Unit-IV: Skill Development: Plant nursery

1. **Nursery:** Definition and Role or objective; nursery infrastructure
2. **Planning and seasonal activities:** Preparation of nursery beds, Planting: direct seeding and transplant, Air layering, Budding , Grafting, cutting, rooting medium, hardening of plant
3. **Nursery management:** Routine garden operations, soil sterilization, seed sowing, pricking, planting and transplanting, shading, stopping or pinching, defoliation, wintering, mulching and topiary.

List of Practical: Paper-II:

1. To prove Mendel's law of segregation with the help of colored beads.
2. To prove Mendel's law of independent assortment with the help of colored beads.
3. To work out the type of gene interaction mentioned in theory from given data.
4. To study different methods of vegetative propagation (Air Layering, cutting, budding and grafting)
5. To study the method of soil sterilization for plant nursery.

Note: 1. Developmental stages are not expected,
2. Short excursion tour/visit to Nursery is expected

B.Sc. SEMESTER-V
PAPER-II
(Plant Ecology and Organic Farming)

Unit-I: Plant and environment:

1. **Ecology:** Definition, branches and significance.
2. **Climatic factors:** Atmospheric (Gaseous composition); Effect of Light and Temperature on vegetation
3. **Edaphic factors:** Pedogenesis, Soil profile, Soil micro-organisms.
4. **Physiographic factors:** Biotic factors: Interaction between plants and animals and humans and interaction between plants growing in a community.

Unit-II: Ecosystem:

1. **Ecosystem:** Definition, types; Components: Biotic and abiotic components, Food chain, Food web, Ecological pyramids.
2. **Autecology:** Definition, Importance, Ecads, Ecotypes: Characteristics and importance, Growth curve.
3. **Synecology:** Definition, Study of community: Quantitative characteristics: Frequency, Density, Abundance; Qualitative characteristics: Life forms, Raunkier's Biological Spectrum and Synthetic characteristics: Presence, fidelity and dominance.

Unit-III: Plant Succession and adaptations:

1. **Plant Succession:** Definition, Causes of succession, Hydrosere, Xerosere
2. **Plant Adaptations:** Morphological and anatomical adaptations of Hydrophyte (*Hydrila, Nymphaea*), Xerophyte (*Casuarina, Nerium*), Halophyte and Epiphyte (*Vanda*).
3. **Biogeochemical cycles:** Nitrogen and Phosphorous

Unit-IV: Skill development: Organic farming:

1. **Organic farming:** Definition, concept, advantages and disadvantages, green manure and organic fertilizers.
2. **Methods:** Recycling of biodegradable kitchen, agricultural and industrial waste.
3. **Methods of:** Preparation of Bio compost, preparation of vermicompost and its type, isolation and inoculum production of VAM.
4. **Organic manure:** Effect of organic manures on growth and yield productivity of various crop plants.

List of Practical: Paper-II:

1. To determine frequency, density and abundance of community by quadrate method.
2. To determine homogeneity of vegetation by Raunkier's frequency diagram.
3. To determine the minimum number of quadrates required for reliable estimate of biomass in grasslands.
4. To study the frequency of herbaceous species in grassland and to compare the frequency distribution with Raunkier's standard frequency diagram.
5. To measure the above ground plant biomass in a grassland.
6. To study soil profile at different locations of nearby area.
7. To estimate transparency, pH and temperature of different water bodies.
8. To estimate salinity of different water samples.

B. Sc. SEMESTER-VI
PAPER-II
(Phytogeography, Utilization of Plants, Techniques and Pharmacognosy)

Unit-I: Phytogeography, Pollution, Natural resources:

1. **Phytogeography:** Principles of phytogeography, Distribution (Wides, Endemics, Discontinuous species); Climatic regions of India, Phytogeographic regions of India (Chaterjee, 1962) (Name, Distribution area, Typical Vegetation)
2. **Environmental pollution:** Causes and Control measures of Agriculture pollution and Noise pollution
3. **Natural Resources:** Renewable and Non-renewable resources, factors for their depletion
4. **Conservation strategies:** Conservation of forest and water resources.

Unit-II: Utilization of plants and Ethnobotany:

1. **Utilization of plants:** Morphology, Utilization and important chemical constituents of the plants: Food (Wheat), Oil (Groundnut), Fiber (Cotton), Spices (Clove), Beverages (Coffee), Medicinal (*Adhatoda vassica*), and Rubber.
2. **Ethnobotany:** Definition, Brief history, branches and importance of Ethnobotany.
3. **Plants of enthnobotanical importance:** Vegetable, Fruits, Seeds, Medicinal and Narcotics (Two plants each with reference to family, parts used and tribal areas)

Unit-III: Microscopy and Techniques:

1. **Microscopy:** Principle, types and application of microscope (Light, Fluorescent, SEM and TEM).
2. **Techniques:** Principle, types and application of Centrifugation, Electrophoresis (SDS-PAGE and Agarose), Spectroscopy (UV-Vis), Chromatography (Paper and Thin Layer Chromatography (TLC))

Unit-IV: Skill development: Pharmacognosy:

1. **Pharmacognosy:** Definition and scope, Drug adulteration: Types; methods of drug evaluation: Biological testing of herbal drugs, phytochemical screening tests for secondary metabolites (Alkaloids and Flavonoids)
2. **Pharmacological plants:** Biological source, staining, diagnosis, micro-chemical tests, chemical constituents, preparation and uses of drug extracted from the plants: *Datura* leaf, *Vinca rosea*, *Plantago ovata* (Isapgol) seeds, *Linum usitatissimum* (Linseed) seeds, *Elettaria cardamomum* fruit, *Coriandrum sativum* fruit, *Eugenia caryophyllus* (Clove) flower-bud, *Rauwolfia serpentina* root, *Zingiber officinale* (Ginger) rhizome.

Note: 1. Developmental stages are not expected,
2. Short excursion tour is expected

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SYLLABUS FOR B.Sc. ZOOLOGY (SEMESTER PATTERN)

(With effect from the academic year 2013-2014)

The semester pattern syllabus for B.Sc. Three Year Degree Course in the Subject - Zoology comprises of six semesters. Each semester is based on six theory periods and six practical periods per week. The examination of each semester shall comprise of two theory papers each of three hours duration and carries 50 marks each and a practical of 4 hours duration carries 30 marks. Internal assessment for each semester based on two theory papers of 10 marks each and shall be conducted by university approved teachers. Internal assessment marks should be submitted to the university one month prior to the final examination. Candidates are expected to pass separately in theory, internal assessment and practical examination.

The Structure of Syllabus for B.Sc. Zoology (Semester Pattern) along with distribution of marks is also displayed in the following Table

Semester	Semesterwise Theory Papers and Practicals	Marks			Total Marks
		Theory	Internal Assessment*	Practical	
Semester - I	**Theory** **Paper – I** : Life and Diversity of Animals-Nonchordates (Protozoa to Annelida) **Paper -II** : Environment Biology **Practical - I** (Based on Paper I & II)	50 50	10 10	 30	150
Semester- II	**Theory** **Paper - III** : Life and Diversity of Animals- Nonchordates (Arthropoda to Hemichordata) **Paper - IV** : Cell Biology **Practical - II** (Based on Paper III & IV)	50 50	10 10	 30	150
Semester- III	**Theory** **Paper - V** : Life and Diversity of Animals-Chordates (Protochordata to Amphibia) **Paper - VI** : Genetics **Practical - III** (Based on Paper V & VI)	50 50	10 10	 30	150
Semester - IV	**Theory** **Paper - VII** : Life and Diversity of Animals-Chordates (Reptilia, Aves and Mammals)	50	10		150

Contd. on Pg. 2

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	Paper - VIII : Molecular Biology and Immunology	50	10		
	Practical - IV (Based on Paper VII & VIII)			30	
Semester - V	**Theory** **Paper - IX** :General Mammalian Physiology I	50	10		150
	Paper - X : Applied Zoology I (Aquaculture and Economic Entomology)	50	10		
	Practical - V (Based on Paper IX & X)			30	
Semester - VI	**Theory** **Paper - XI** : General Mammalian Physiology II	50	10		150
	Paper - XII : Applied Zoology II (Biotechniques, Microtechnique, Biotechnology, Bioinformatics and Biostatistics)	50	10		
	Practical - VI (Based on Paper XI & XII)			30	
		Grand total			900

*Internal assessment –

- (For Semester I to IV) Based on students attendance and the performance during Unit test exam. and field work
- (For Semester V & VI) Based on students attendance and the performance during Unit test exam., field work and seminar

Semester - I

Paper – I : Life and Diversity of Animals - Nonchordates (Protozoa to Annelida)

Unit – I **(9 Periods)**

1.1 **Protozoa** : General characters and classification up to classes

1.2 ***Paramoecium*** : Structure and reproduction

1.3 ***Plasmodium*** : Structure and life cycle

1.4 **Parasitic Protozoans of Man :** *Entamoeba, Trypanosoma, Giardia and Leishmania* - Mode of infection and its control

Unit – II **(9 Periods)**

2.1 **Porifera** : General characters and classification up to classes

2.2 ***Sycon*** : Structure, reproduction and development, Canal system in sponges

2.3 **Coelenterata** : General characters and classification up to classes

2.4 ***Obelia*** : Structure and life cycle, corals and coral reef formation

Unit – III **(9 Periods)**

3.1 **Helminthes** : General characters and classification up to classes

3.2 ***Ascaris*** : External morphology, reproductive system and life cycle

3.3 ***Taenia solium*** : Structure and life cycle

3.4 **Elementary idea of parasitic adaptations in helminthes**

Unit – IV **(9 Periods)**

4.1 **Annelida** : General characters and classification up to classes

4.2 **Leech** : Morphology, digestive and urinogenital system

4.3 Trochophore larva and its significance

4.4 Vermiculture and its importance

Semester – I

Paper – II : Environmental Biology

Unit – I **(9 Periods)**

1.1 Atmosphere: Major zones and its importance, composition of air

1.2 Hydrosphere: Global distribution of water, Physico-chemical characteristics of water

1.3 Lithosphere: Types of rocks, formation of soil

1.4 Renewable and non- renewable energy sources

Unit – II **(9 Periods)**

2.1 Ecosystem - Definition and types

2.2 Detailed study of pond ecosystem

2.3 Food chain, food web and ecological pyramids

2.4 Energy flow in an ecosystem, Single channel, Y – shape and Universal model

Unit – III **(9 Periods)**

3.1 Biodiversity and its conservation

3.2 Causes of reduction of biodiversity

3.3 Wildlife conservation acts (1972 and 1984), Introductory study of national parks and sanctuaries – Tadoba, Kanha, Bharatpur and Nagzira

3.4 Hot spots of biodiversity in India

Unit – IV **(9 Periods)**

4.1 Sources, effect and control measures of air pollution, Acid rain, green house effect, ozone depletion and global warming

4.2 Sources, effect and control measures of water pollution

4.3 Sources effect and control measures of noise pollution

4.4 Toxic effect of heavy metals (lead, cadmium and mercury) – Bioaccumulation and biomagnification

Semester – I

PRACTICAL – I (Based on Paper – I and II)

Section A : Life and Diversity of Animals – Nonchordates (Protozoa to Annelida)

& Section B : Environmental Biology

Section A : Life and Diversity of Animals – Nonchordates (Protozoa to Annelida)

1. Study of museum specimens (Classification of animals up to orders)

I. Protozoa (Slides) : *Paramoecium ,Euglena,* Amoeba, *Plasmodium vivax*

II. Porifera: *Sycon, Leucosolenia, Hyalonema, Euplectella, Spongilla*

III. Coelenterata : *Obelia, Aurelia, Tubipora, Fungia, Adamsia*

IV. Platyhelminthes : *Planaria, Fasciola, Taenia*

V. Aschelminthes : *Ascaris, Drancunculus, Ancylostoma, Wuchereria*

VI. Annelida : *Aphrodite, Nereis, Chaetopteurs, Tubifix, Hirudinaria*

2. Study of permanent slides

Enatmoeba, Giardia, Sponge gemmules, Sponge spicules,V.S. *Sycon*, T.S. *Sycon, Obelia* medusa, Miracidium, Redia and Cercaria larvae of *Fasciola*,T.S. male and female *Ascaris,* Scolex of *Taenia,* Mature and gravid proglottids of *Taenia solium,* T.S. of Leech through crop pockets, Trochophore larva

3. Dissection

Digestive, nervous and reproductive system of Earthworm

4. Mounting

Spicules and gemmules of Sponge, *Obelia* colony, *Nereis* parapodia, Jaws of Leech, Nephridia of Leech.

Section B: Environmental Biology

1. Estimation of dissolved oxygen of water
2. Estimation of free CO_2 of water
3. Estimation of pH of water sample
4. Estimation of total hardness of water
5. Study of pond ecosystem - Producers, consumers and decomposers
6. Quantitative analysis of plankton

Visit to a National park and Sanctuary

Distribution of Marks – **Total Marks 30**

i.	Identification and Comment on Spots (4 Museum specimens + 1 Env. bio. spot + 3 slides)	08
ii.	Dissection -	08
iii.	Environmental biology experiment	04
iv.	Permanent stained preparation	03
v.	Submission of certified practical record	03
vi.	Submission of Slides & tour diary	02
vii.	Viva voce	02

During the academic sessions from 2018-2023, various activities were conducted regarding professional ethics, Gender, Human values, Environment, and sustainability. The link of activities conducted are mentioned below

Professional Ethics, Human values, and Environmental and sustainability activities are reflected through NSS and Eco-club, Birth and death anniversary activities.

Gender activities are conducted under women's cell

Year	**Scheme**	**Link**
2018-19	NSS	Link
	Birth and Death Anniversary	Link
	Women Cell	Link
2019-20	NSS	Link
	Women Cell	Link
	Birth and Death Anniversary	Link
2020-21	NSS	Link
	Women Cell	Link
	Birth and Death Anniversary	Link
2021-22	NSS	Link
	Women Cell	Link
	Birth and Death Anniversary	Link
	Eco-club	Link
2022-23	NSS	**Link for Activities**
	Women Cell	Link
	Birth and Death Anniversary	Link
	Eco-club	Link