VSPM Academy of Higher Education
Jawaharlal Nehru Arts, Commerce and Science College Wadi, Nagpur
Dist. Nagpur (Maharashtra) 440023

Criterion 1
Curricular Aspects

1.3 Curriculum Enrichment

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

Documents Attached

Sr. No	Name of the Document	Link
1.	1.3.1 Supporting Document	

VSPM Academy of Higher Education Nagpur's
Jawaharlal Nehru Arts, Commerce and Science
College, Wadi, Nagpur- 440023 (M.S.)
(Affiliated to RTM Nagpur University, Nagpur)
Website: www.jncwadi.ac.in E-mail: jnc.wadi@rediffmail.com Phone: (07104) 220963

Date: 10/09/2024

This document hereby confirms that the data enclosed, comprising information, supporting documents, numerical data, and reports, has been thoroughly examined and authenticated by both the IQAC and the Principal, and is deemed accurate.

Convenor
(IQAC)
JN. Arts, Comm. & Sci. College
Wadi, Nagpur

Principal
Jawaharlal Nehru Arts, Comm. & Sci.
College, Wadi, Nagpur

JAWAHARLAL NEHRU ARTS, COMM. & SCI. COLLEGE

Key Indicator-1.3 Curriculum Enrichment (30)

Metric No.		Weightage
1.3.1 Q1M	***Institutional integrates crosscutting issues relevant to Professional Ethics, Gender, Human Values, Environment and Sustainability in transacting the Curriculum*** Write description in a maximum of 500 words ***File Description:*** • Upload Additional Information • Provide link for Additional Information Our institute integrates cross cutting issues which is relevant to Professional Ethics, Gender, Human Values, Environment and Sustainability in transacting the Curriculum *RTM Nagpur University has prescribed Environmental Studies as a compulsory subject to Second Year B.A., B.Com and B.Sc. programs to create awareness about Ehics, Skill development, & Environment among the students. The courses conducted in the institute covers important issues like gender sensitization, women empowerment, Environment awareness, human values and ethics and issues of social awareness. Like blood donation camp and awareness rally, *Apart from regular curriculum, Women Grievance and Redressal, NSS and Environment Studies organize various programs by inviting resource persons to deliver guest lectures on different cross- cutting issues under JNC Nature Club followed by the students. Women Grievance and Redressal Cell organized programs like: Women Health problems awareness, International Women's Day, Female Feticide, Superstitions & Educate Girl child Awareness Sexual Harassment of Women at Workplace and Sexual Harassment and Legal Protection, Workshop on making cloth and paper bags, NSS Unit & Environmental studies organize awareness programs like: Wildlife Protection and Conservation, Hygiene and Cleanliness Rally and Drive, Celebration of World Earth Day, Waste Management, Bird Conservation & Nest Making, Sadbhavna Week, Wildlife Photography Competition, Guest lecture on Environmental issues. As a part of curriculum departments organizes visits to Botanical Parks, Sericulture and Apiculture Units, Raman Science Centre, Fish farm visit and Educational excursion. Sexual Harassment of Women at Workplace and Sexual Harassment and Legal Protection.	**10**

- NSS Unit & Environmental studies organize awareness programs :-
  Guest lecture on Environmental issues,
  Workshop on "Creating Scientific Temperament-Busting Superstitions, "GREAT GLOBAL BACKYARD BIRD COUNT, WORLD WILDLIFE DAY (Poster Competition for students.

- During Covid period Online Wild Life Week Organized in which Wild Life Photography Competition for students was conducted and Online (Webinar) Guest Lecture regarding Sustainable Development, and Nature Walk for the Students Organized in Three parts at Seminary Hills, in Collaboration with Maharashtra State Forest Department.

As a part of curriculum departments organizes visits to Botanical Parks, Sericulture and Apiculture Units, Raman Science Centre, Fish farm visit and Educational excursion. But due to **Covid-19** this year we didn't plan for the visit and excursion for the students.
Environmental studies organize awareness programs like: Guest lecture on Environmental issues, various programs for the **session** WORLD ENVIRONMENT DAY- Organized Online National Webinar on World Environment Day for students, in collaboration with WWF & Central India Landscape 98 students were participated in this event on 5th JUNE 2021. T- Shirt Painting Competition, Visit to Biotechnology Lab Endangered Species Day.
The courses conducted in the college cover important issues like gender sensitization, women empowerment, Environment awareness, human values and ethics and issues of social awareness. With the exception of regular curriculum, Women Grievance and Redressel, NSS and Environmental studies organize awareness programs like: Guest lecture on Environmental issues, Poster Competition, Butterfly Walk, and Educational Tour etc.
Various programs for the session 2022-2023 are as follows-
Butterfly and Nature Walk, Guest lecture on the topic Wild Life. Butterfly survey, Aranya wachan, Environmental Tour at Navegaon Bandh and Itiadoh.
The institute is under CCTV surveillance to secure the safety of both male and female students. In our Institute for girl's students has a girl's common room with an equipped facility and Sanitary Napkin machine.
Programs for the session 2023-2024 are as follows-
National Conference on Multidisciplinary Research & Studies, Intercollegiate Seminar Competition Organized by Faculty of Science and IQAC, One Day Workshop on Research Methodology. Competitive Exam and Career Guidance Workshop held. One Day Workshop on Millet's (Guest Lecture), One Day Visit to Fish Farm at College of Fishery Science and Seed Production Unit,

	Telangkhedi, Nagpur, Inaugural function of Zoological Society followed by Poster Competition on Wild Life and Guest Lecture, Bhartiya Sanskruti Gyan Pariksha Sponsored by Dev Sanskruti Vishwavidyalay Haridwar, One Day Biological Excursion Tour at Kuwara Bhivsen, and Ghogra Mahadev, Poster Competition on Millets. under **International Year of Nutritious Millets 2023,** Visit to Apiculture Unit at Centre for Bee Cultivation And Bee Management at Nalwadi Wardha, Birdwatching Program at 1) Ambazari Biodiversity Park, --22,2) Gorewada Lake.—11 3) Grenade Biodiversity Park-----07, One day Workshop on Women's Empowerment under this Poster Competition and Rally was organized, Visit to Rajiv Gandhi Biotechnology Centre, Guest lecture on the occasion of World Earth Day, by Shri Ajinkya Bhatkar.	

VSPM Academy of Higher Education Nagpur's

Jawaharlal Nehru Arts, Commerce and Science College, Wadi, Nagpur- 440023 (M.S.)

(Affiliated to RTM Nagpur University, Nagpur)

Website: www.jncwadi.ac.in E-mail: jnc.wadi@rediffmail.com Phone: (07104) 220963

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 subject showing crosscutting issue

Link for the Document:-

Syllabus of subject showing crosscutting issue

Environmental Studies:- RTM Nagpur University letter

NOTIFICATION

No. 3.

Dated 7 February, 200

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 months 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., 200

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

Guidelines for Implimentation of Compulsory Course on Environmental Studies

In pursuance of the verdict of **Honourable Spreme Court of India**, UGC module syllabus of Environmental Studies and make it compulsory to all the Universities and college in India. The Directorate of Higher Education, Government of Maharashtra has also made it compulsory to comply with the decision of Honourable Spreme Court.

In this context, RTM Nagpur University, Nagpur, notification dated 27th February, 2007, Hon'ble Vice-Chancellor, RTM Nagpur University, Nagpur, has approved under Section 1(7) of the Maharashtra University Act, 1994 on the behalf of Academic Council accepting the syllabus for **"COMPULSORY COURSE OF SIX MONTH DURATION IN ENVIRONMENTAL STUDIES"** at undergraduate course of all branches and faculties of higher education on the guideline of already accepted and approved pattern of UGC model to be implemented form session 2007-08.

1. The "***Course on Environmental Studies***" 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.

2. At the end of the course, the student would be evaluated for 100 marks; of them theory paper carry 75 marks and Field note book would be evaluated for 25 marks.

3. The theory question paper would carry 75 marks. Of them, 50 marks for objective type questions (each objective question of one mark) covering various aspects of the syllabus and 25 marks for one ***"Essay"*** type question.

4. The distribution of 100 marks as follows:

(i) Field note book	:	25 marks
(ii) Objective Questions	:	50 marks
(iii)Essay type question	:	25 marks
(iv) Passing marks	:	40marks

5. The result would be declared in grades:

Grade		**Marks**
"O"	:	Above 75 marks
"A"	:	61 - 75 marks
"B"	:	51 – 60 marks
"C"	:	40 – 50 marks

6. The candidates will have to pass in the examination of this course in order to obtain degree certificate from the university.

OR

7. In view of entire course the student may be assign a project work encompassing Community/Bio-diversity Register (PBR) of any Gram-Panchyat as per format of Bio-diversity Authority of India under the guidance of a teacher. This PBR would be evaluated for 100 marks.

****

CURRICULUM FOR THE COMPULSORY COURSE ON ENVIRONMENTAL STUDIES

(At undergraduate level, compulsory for all faculties)

Unit - I : Introduction

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

Unit - II : Natural resources

Renewable & Non-renewable Resources; & associated problems; role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyle

Unit-III : Ecosystem

Concept of an ecosystem- understanding ecosystem, ecosystem degradation, resources utilization
Structure & functions of an ecosystem – producers, consumers & decomposers.
Energy flow in an ecosystem ; Water, carbon, O_2 & energy cycles; integration of cycles in nature
Ecological successions; Food chains, food webs & ecological pyramids; Ecosystem types-characteristic features, structure & functions of forest, grassland, desert and aquatic ecosystem

Unit –IV : Bio-diversity

Introduction-biodiversity at genetic, species & ecosystem levels; Bio-geographic classification of India
Value of bio-diversity – Consumptive use value, productive use value, social, ethical, moral, aesthetic & optional value of biodiversity.
Threats to bio-diversity – habitat loss, poaching of wildlife, man-wild life conflicts
Common endangered & endemic plant and animal species of India. In-situ & Ex-situ conservation of bio-diversity

Unit –V : Pollution

Definition, causes, effects & control measures air, water, soil, marine, noise & thermal pollutions and nuclear hazards
Solid waste management – causes, effects and control measures of urban and industrial wastes
Role of individual & institutions in prevention of pollution
Disaster management – Floods, earthquake, Cyclone, Landslides

Unit –VI : Social issues and the Environment

Unsustainable to sustainable development; Urban problems related to energy; Water conservation, rainwater harvesting, watershed management; problems and concerns of resettlement arid rehabilitation of affected people
Environmental ethics – issues and possible solutions – resource consumption patterns and need for equitable utilization; equity disparity in western & eastern countries; urban and rural equity issues; need for gender equity.
Preserving resources for future generation. The rights of animals; ethical basis of environment education and awareness; Conservation ethics and traditional value systems of India
Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents & holocausts
Wasteland reclamation; Consumerism and waste products.
Issues involved in enforcement of environmental legislations – Environment Impact Assessment (EIA); Citizens actions and action groups.
Public awareness – Using an environmental calendar of activities; self initiation.

Unit-VI : Human Population and the Environment

Global population growth; variation among nations; Population explosion; Family welfare programmes – methods of sterilization; Urbanization
Environment & human health – Climate and health, infectious diseases, water-related diseases, risk due to chemicals in food, cancer and an environment
Human rights – Equity, Nutrition and health rights, intellectual property rights(IPRS), Community Bio-diversity register (CBRs)
Value Education – environmental values, valuing nature, valuing culture, social justice, and human heritage, equitable use of resources, common property resources, and ecological degradation.
HIV/AIDS; Women and Child Welfare; information technology in environment and human health

RTM NAGPUR UNIVERSITY, NAGPUR

Semester Pattern Syllabus with Skill Development

For B. Sc. Botany

B. Sc. SEMESTER- I

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

B. Sc. SEMESTER-II

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

B. Sc. SEMESTER-III

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

B. Sc. SEMESTER-IV

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

B. Sc. SEMESTER-V

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

B. Sc. SEMESTER-VI

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

.....

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, Azotobactor,* 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-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

F2

B. Sc. SEMESTER-II
PAPER-II
(Morphology of Angiosperms and Floriculture)

Unit-I: Vegetative Morphology:

1. **Root:** Tap root and adventitious root, modification of root for storage and respiration
2. **Stem:** Shape, surface, and nature. Branching (Monopodial and Sympodial), Modification of stem (Runner, Rhizome, Tuber, Bulb)
3. **Leaf:** Typical leaf, Types (Simple and Compound), Types of phyllotaxy, Venation, Modification of leaf (Tendril, Phyllode)

Unit-II: Reproductive Morphology:

1. **Inflorescence:** Definition, Racemose, Cymose and Special types
2. **Flower:** Definition, Structure of Typical flower, Variation in thalamus (Androphore, Gynophore and Gynandrophore)
3. **Calyx and Corolla:** Cohesion, Forms of corolla and Aestivation.
4. **Androecium:** Parts, Cohesion, Adhesion and Fixation.

Unit-III: Carpel and Fruit:

1. **Gynoecium:** Parts, Cohesion, Adhesion and Placentation.
2. **Fruit:** Definition, Pericarp, Types of fruits: Simple (Dehiscent, Schizocarpic, Dry Indehiscent, Fleshy Indehiscent); Aggregate (Etaerio) fruits, Composite Fruits (Sorosis and Syconus).

Unit-IV: Skill Development: Floriculture:

1. **Floriculture:** Definition, commercial aspects.
2. **Methods of cultivation of:** Important cut flowers such as Carnation, Asters, Gerbera, Dahlia, Marigold with reference to soil type, sowing pattern, weather condition, irrigation regime, fertilizers and harvesting.
3. Diseases and control measures.

List of practical: Paper-II:

1. Study of different root modifications
2. Study of nature of branching and modification of stem
3. Study of leaf: Types (Simple & Compound), Phyllotaxy, Venation and Modifications.
4. Inflorescence: Types mentioned in theory.
5. Flower: Parts, calyx, corolla, androecium, gynoecium, variation in thalamus.
6. Fruits: Study of different types of fruits
7. Identification and commercial aspect of cut flowers mentioned in theory.

Note: 1. Developmental stages are not expected
2 Short excursion tour/visit to soil testing laboratory or Polyhouse is expected

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 (*Enigmocarpon*)
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-I
(Cell Biology, Plant Breeding, Evolution and Seed Technology)

Unit-I: Cell organization:

1. **Cell:** Brief account of Cell theory, Comparison between Prokaryotic and Eukaryotic cell organization, Structure of typical plant cell.
2. **Structure and functions of:** Cell wall, Plasma membrane (Fluid Mosaic model), Endoplasmic reticulum, Golgi complex, Ribosomes and Vacuole.

Unit-II: Cell biology:

1. **Structure and functions of:** Chloroplast, Mitochondria and Nucleus
2. **Chromosome morphology:** Chromatid, chromomeres, centromere, telomere, secondary constriction, satellite.
3. **Molecular organization of chromosome:** Nucleosome model.
4. **Sex Chromosomes:** Definition, Structure of sex chromosomes (X and Y) in *Melandrium* plant.
5. **Cell division:** Mitosis and Meiosis (Mechanism and significance).

Unit-III: Plant breeding and Evolution.

1. **Plant Breeding:** Definition and objectives
2. **Methods of Plant breeding:** Definition; Procedure or technique of Pure line selection, Clonal selection, Hybridization, Heterosis (Definition and Scope)
3. **Biostatistics:** Mean, Median, Mode, Standard deviation and Standard error
4. **Evolution:** Neo-Darwinism and Miller's theory.

Unit-IV: Skill Development: Seed Technology

1. **Seed:** Structure and types
2. **Seed dormancy:** Causes of seed dormancy, methods to break seed dormancy
3. **Seed technology:** Seed storage, seed banks, factors affecting seed viability, genetic erosion, methods of seed production, seed testing and certification.
4. **Commercial types of seeds:** Farmers seed, foundation seeds, breeders seed and certified seed.

List of Practical: Paper-I:

1. Study of cell organelles with the help of photographs or slides.
2. Study of mitosis in suitable plant material.
3. Study of meiosis in suitable plant material.
4. To calculate mean, median, mode and standard error of the given data.
5. To study the methods of breaking seed dormancy.
6. To study the seed viability and percentage seed germination by paper slot method or tetrazolium salt.

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-I
(Plant Physiology, Mineral Nutrition and Hydroponics)

Unit-I: Plant-Water relation:

1. **Water relation:** Concept and significanceof Imbibition, Diffusion, Osmosis, Osmotic pressure, Cell as osmotic system, DPD, Plasmolysis.
2. **Ascent of sap:** Definition, Root pressure theory, Cohesion-adhesion theory.
3. **Transpiration:** Definition, Types, Mechanism of Stomatal movements (K^+ Malate Hypothesis)
4. **Phloem transport:** Munch Hypothesis
5. **Mineral uptake:** Passive (Donnan's Equilibrium), Active (Carrier Concept).

Unit-II: Photosynthesis and Respiration:

1. **Photosynthesis:** Definition, Significance; Photosynthetic pigments (Type and role), Photosystems.
2. **Mechanism of photosynthesis:** Light reaction:Cyclic and non- cyclic photophosphorylation, Dark Reaction: Calvin Cycle (C_3), HSK pathway (C_4), CAM pathway.
3. **Respiration:** Definition, Types, significance and Respiratory Quotient (RQ)
4. **Mechanism of respiration:** Glycolysis, Kreb's Cycle, Oxidative phosphorylation (ETS).
5. **Fermentation:** Definition,Types, Mechanism of fermentation: Lactic acid and Alcoholic.

Unit-III: N- Fixation, Plant Movements, Photoperiodism:

1. **Nitrogen Metabolism:** Definition, Mechanism of Biological N-Fixation (Symbiotic and Non-symbiotic)
2. **Plant Movements:** Definition, Outline, Tropic (Geotropic, Phototropic, Thigmotropic) and Nastic (Seismonastic).
3. **Photoperiodism:** Definition, Classification (Short Day Plant, Long Day Plant and Day Neutral Plant), photoperiodic induction, Florigen hormone.
4. Circadian rhythms and Biological clock.

Unit-IV: Skill Development: Mineral nutrition and Hydroponics:

1. **Mineral nutrition:** Definition, source, types (Macro and micronutrients)
2. **Role and deficiency symptoms of Macronutrients:** Nitrogen, Phosphorous, Potassium and Calcium
3. **Role and deficiency symptoms of Micronutrients:** Iron, Manganese, Boron and Zinc.
4. **Hydroponics:** Definition, advantages and disadvantages, Types of hydroponic systems (Deep water culture and Nutrient Film Technique); Nutrient composition.
5. **Methods:** Hydroponic farming of Tomato, Cucumber, Spinach and Cabbage.

List of Practical: Sem.-V, Paper-I:

A. **Major Physiology Experiments:**

1. To study the effect of temperature on the permeability of cell membrane.
2. To study the effect of various organic solvents on the permeability of cell membrane.
3. To determine the osmotic pressure/potential of vacuolar sap by plasmolytic method.
4. To study ascent of sap in suitable plant material.

B. Sc. SEMESTER-VI
PAPER-I
(Biochemistry, Biotechnology and Herbal Technology)

Unit-I: Biochemistry: Lipids and Enzymology:

1. **Lipids:** Definition, Properties and role of fatty acids, oils and waxes; Degradation of fats (β-Oxidationand Glyoxylic acid cycle)
2. **Enzymology:**Enzymes:Definition, Nomenclature and classification of enzymes; Characteristics (Properties) of enzymes
3. **Basic concepts of enzymology:** Holoenzyme, Apoenzyme, Prosthetic group, Co-enzyme, Co-factor, Active site, Isoenzyme
4. **Mechanism of enzyme action:** Enzyme-substrate complex theory, Lock and key model, Induced fit model
5. **Enzyme inhibitors:** Definition, Competitive and noncompetitive.

Unit-II: Plant tissue culture:

1. **Brief account of:** Tissue culture, Totipotency, Explant, Aseptic cultures, Micropropogation, Differentiation and Morphogenesis.
2. **Methods of sterilization:** Autoclaving, Dry heat and Chemical sterilization
3. **Culture Media:** MS media (Preparation and nutrient contents)
4. **Tissue Cultures:** Callus and organ culture (Shoot tip and Anther culture) and its applications
5. Protoplast culture and its applications.
6. Applications of tissue culture

Unit-III: Genetic engineering:

1. **Genetic engineering:** Definition, Tools in genetic engineering: Enzymes (Restriction enzymes, Ligases, DNA-polymerases), Host.
2. **Cloning vectors:** General Characteristics, method of Isolation of vector, Plasmid as a vector (pBR^{322}).
3. **DNA Library:** Definition, Construction of Genomic library and C-DNA library and their significance
4. ***Agrobacterium* mediated gene transfer:** Structure of Ti-plasmid, mechanism of transfer.
5. Role of biotechnology in crop improvement

Unit-IV: Skill Development: Herbal technology:

1. **Herbal technology:** History and importance of herbal technology
2. **Basic concepts:** Drugs, cosmetics, Natural dyes, Difference between organized and unorganized drugs
3. **Methods:** Cultivation, harvesting, processing, storage and utilization of *Withania somnifera, Aloe vera, Ocimum sanctum*
4. **Dye yielding herbal plants:** *Lawsonia alba* (Henna), *Rivinia humilis, Indigofera tinctoria*
5. **Herbs used in cosmetics:** *Cocos nucifera* (Coconut oil), *Curcuma longa* (Turmeric), *Cucumis sativa* (Cucumber), *Lavendula* sps.(Lavender oil), *Rosa* sps. (Rose), *Hibiscus rosa-sinensis* (China rose) (With reference to parts used, chemical constituents, uses and Marketed products)

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

25.2.19

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.

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 गाबा: राजनीति-सिद्धांत एवं चिंतन, राजनीति-सिद्धांत के विवेच्य विषय.
7. गर्वड़ जोगेन्द्र, हाशम शेख, राजकीय सिद्धांत, विश्व प्रकाशन नागपूर, 2013.
8. देशमुख अलका: राजकीय सिद्धांत, साईनाथ प्रकाशन नागपूर, 2014.
9. 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

S. Ashok

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.

RVR

RASHTRASANT TUKADOJI MAHARAJ, NAGPUR UNIVERSITY, NAGPUR

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

Contd. on Pg. 2

	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	01