

**Mahatma Gandhi University
B.Sc Botany Programme**

SEMESTER I

Course 1

BO1B01U

**Methodology and Perspectives of Science
&
An Introduction to the World of Plant Diversity**

**Methodology and Perspectives of Science
(Theory 36 hours, Practical 36 hours) (Theory Credit 2, Practical credit 1)**

Methodology and Perspectives of Science (Theory 18hours, Practical 18 hours)

Module 1.

8 hours

Introduction to science and scientific methods

- Introduction to science
- Steps in scientific methods
 - observation and thoughts
 - formulation of a hypothesis
 - designing of experiments
 - testing of hypothesis
 - formulation of theories
 - Revision of scientific theories with the advent of new technologies

Module 2.

10

hours

Experimentation in science

- Selection of a problem
- Searching the literature
- Selection of variables, study area, and a suitable design
- Necessity of units and dimensions
 - Units of length, volume, area, concentration, temperature, pressure
 - Setting of hypothesis, Null- hypothesis and alternative hypothesis
- Need of control, treatments and replication
- Analysis, presentation and interpretation of data
- Testing of hypothesis, need of statistical tools (study of specific tools is not required)
- Examples of great experiments in life sciences
 - An example of moving from a question to hypothesis and then to an experimental design
 - Contributions and the great experiments of Louis Pasteur, and Robert Koch
- Ethics in science

Practical **18**
hours

1. Design and perform a simple experiment to familiarize with the methodology of science
2. Select an important classical experiment and find out the different elements of scientific method
3. Prepare a biographical sketch of great scientists with special emphasis on the scientific methodology involved in their experiments
4. Prepare $\text{CuSO}_4 \cdot \text{H}_2\text{O}$ solution of different molarity using a stock solution
5. Determination of the area of different types of leaves using graph paper

Introduction to the World of Plant Diversity (**Theory 18 hours, Practical 18 hours**)

Module 1 **3**
hours

- Plants, their uniqueness and importance as
 - Primary producers
 - Source of oxygen
 - Source of materials for food and shelter
 - Medicines and other compounds derived from plants
 - Source of fuel (fossil fuel, biofuel)
 - Recreational value(a brief account with examples alone is required)

Module 2. **3 hours**

Unity of living organisms

Unity in,

- Cellular organization
- Cell structure
- Metabolism
- Genetics
- Cell division
- Sexual reproduction (Only a preliminary study about the unity of different live forms in the above mentioned aspects alone is required)

Module 3. **12**
hours

1. Diversity of living organisms [No type study is expected]

- **Prokaryotes**
 - Bacteria – general characteristics, variation in form (bacillus, coccus, vibrio, spirillum)

- Cyanobacteria / BGA (No type study is intended) – general characteristics, pigments in Cyanobacteria, variation in form
- **Eukaryotes**
 - Eichler's Classification
 - **Cryptogams**
 - Algae:-
 - General characteristics
 - Diversity in thallus morphology (Unicellular, colonial, unbranched filamentous, branched filamentous)
 - Diversity in pigments (Pigments characteristic of Chlorophyceae, Rhodophyceae and Phaeophyceae)
 - Fungi
 - General characteristics
 - Diversity in thallus morphology (unicellular forms, aseptate and septate hyphal forms)
 - Lichens
 - General characteristics
 - Diversity in thallus morphology (crustose, foliose and fruticose forms)
 - Bryophytes
 - General characteristics
 - Diversity in thallus morphology
 - Alternation of generation, prominence of gametophyte
 - Concept of embryo
 - Pteridophytes
 - General characteristics
 - Diversity in morphology
 - Concept of vasculature (study of different types of steles is not required)
 - Alternation of generation, prominence of sporophyte
 - Phanerogams**
 - Gymnosperms
 - General characteristics
 - Diversity in morphology
 - As the first plant group exhibiting seed habit, advantages of seed
 - Special structures which contributed to the development of seed (ovule, integuments of ovule, endosperm)
 - Angiosperms
 - General characteristics
 - Diversity in morphology (dicots, monocots, herbs, shrubs, trees, climbers, twiners, branched, unbranched)

- Concept of fruit, advantages of fruit
- Special structures which contributed to the development of fruit (ovary, placenta)

-Animals

- Major differences between plants and animals
(Detailed study of different classes not required)
- **Habitat Diversity** (Brief study only)
 - Aquatic:- Fresh water, marine, mangrove
 - Terrestrial:- Evergreen forest, deciduous forest, grass land
 - Epiphytic
- **Evolutionary trends in the plant world** (shift in habitat from aquatic to terrestrial, shift in prominence of gametophyte to sporophyte, shift from thalloid forms to differentiated forms, evolution of conducting tissue; tracheids to vessels, origin of seed and fruit)
- Interactions in the plant world. Examples of,
 - Plant – plant interactions (Brief account of Parasitic plants and epiphytes)
 - Plant – microbe interactions (Brief account of root nodules and Micorrhiza)
 - Plant – animal interactions (Brief account of Leaf and stem galls and mermicophylly)

Practical

18 hours

1. Collect, identify, record and submit 3 genera each from algae, fungi, bryophytes, pteridophytes, gymnosperms and angiosperms. Use appropriate preservation techniques.
2. Study and submit a report on any one of the interactions observed in the plant world
3. Conduct a field visit to any one of the ecosystems/ botanic gardens to experience the plant diversity. Submit a report with photographs.
4. From a lot of given materials identify a particular plant group
5. From a lot of given materials identify plants with vascular elements, plants which can produce seeds, fruits, embryos

References

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**Mahatma Gandhi University
B.Sc Botany Programme**

SEMESTER II

Course 2

BO2B02U

General Informatics and Methodologies in Plant Sciences

A. General Informatics

(Theory 36 hours, Practical 36 hours) (Theory Credit 2, Practical credit 1)

General Informatics (Theory 18 hours, Practical 18 hours)

Module 1.

Overview of the information technology 3 hours

- Features of the modern personal computers and peripherals.
- Internet as a knowledge repository, e-mail, search engines (Google,) study of educational sites related to life sciences (DNAi, Scitable) , academic search techniques,(Science direct and INFLIBNET)
- Introduction to the use of information technology in teaching and learning

Module 2.

Use of computers 15 hours

- DOS – The basic concept of operating systems (Study of commands not required)
- MS-WINDOWS:- logging to windows, organizing files and folders, copying, moving, deleting and saving documents, installing software, installing hardware
- MS-WORD:- word processing using WORD, editing tools (cut , copy, paste,) formatting tools (font, paragraph) use of spell check, inserting tables (draw), inserting graphs and pictures
- MS-EXCEL:- Creating a worksheet, data entry, sorting (ascending and descending), use of statistical tools in EXCEL (SUM, MEAN, MODE, MEDIAN), preparation of graphs (bar diagram, pie chart and line graph)

-MS-POWERPOINT:- Creating a presentation, Inserting tables, charts and pictures into slides,
Use of animation tools

Practicals

18 hours

1. Gather information and pictures on a given topic using the internet. Make a list of the sites visited for the purpose
2. Prepare a project report using MS-WORD based on the information and pictures gathered from the internet.
3. Prepare a worksheet using a set of data collected and find out the SUM, MEAN, MEDIAN and MODE using EXCEL
4. Prepare suitable tables/ charts/graphs based on the data using EXCEL
5. Prepare a powerpoint presentation based on the 1& 2 exercises

B. Methodologies of Plant Science

(Theory 18 hours, Practical 18 hours)

Module 1.

**Microtechnique
hours**

6

- Introduction
- Microscopy:- simple, compound, phase contrast, fluorescent, confocal and electron microscopes (working principle and application only)
- Microtome:- rotary, sledge (application only)
- Killing and fixing :- Purpose,
Agents used:-
Killing agents - Formalin, Ethyl alcohol
Fixing agents - Carnoy's fluid, Farmers' fluid, FAA
- Dehydration:- Purpose, Agent used - Ethyl alcohol
- Sectioning:- Hand sections, microtomy
- Staining technique:- Principle of staining
Stains:- Safranin, Hematoxylin, Acetocarmine
Vital stains: Purpose , Examples: Neutral red and Evan's blue
Mordents : Purpose and examples
Single staining and Double staining
- Mounting and Mounting Media, Purpose of mounting media , Glycerin, DPX, Canada balsam
- Use of permanent whole mounts, permanent sections
- Maceration
- Smear and squash preparation

**Practicals
hours**

2

1. Maceration and identification of tracheary elements

Module 2

Biophysics

3

hours

- Principles and applications of colorimeter, spectrophotometer and centrifuge, Beer-Lambert's Law,
- Separation methods :- chromatography ; thin layer , paper, column (principle and applications only) , electrophoresis ; PAGE, Agarose gel electrophoresis(Principle and applications only)
- pH:- concept of pH, methods to measure pH ; pH paper and pH meter,
- Buffers:- definition, functions of buffers in biological systems, use of buffers in biological research, examples of commonly used buffers

Practicals

6

hours

1. Preparation of 0.1M sodium phosphate buffer (pH 6 and 7)
2. Measurement of pH using pH meter
3. Paper chromatography of plant pigments (demonstration)
4. Electrophoresis of nucleic acids (demonstration)
5. Column chromatography of plant pigments (demonstration)

Module 3

Biostatistics

8 hours

- Introduction, statistical terms and symbols
- Sample:- concept of sample, sampling methods,
- Collection and representation of data, graphic representation of data
- Measures of central tendency:- mean, mode, median
- Measures of dispersion:- standard deviation, standard error
- Distribution patterns:- normal distribution, binomial distribution
- t-test :- introduction, uses, procedure
- chi-square test:- introduction, uses, procedure

Practicals

10

hours

1. Collect numerical data and find out the central tendencies
2. Familiarize with situations requiring t-test, chi-square test

Module 4

Research Methodology

1

Hour

- Need for research
- Types of research
- Scientific literature, Books, Research Journals, Reputed National and International journals in life sciences, Research paper
- INSDOC services
- Laboratory Etiquette
- Laboratory Hygiene

Reference:

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MAHATMA GANDHI UNIVERSITY

B.Sc. BOTANY PROGRAMME

Semester III

Course-3

B03B03U

ANATOMY AND REPRODUCTIVE BOTANY OF ANGIOSPERMS

(Theory: 54 hours; Practical: 36 hours) (Theory Credit 3, Practical Credit1)

Course Objectives

1. This course aims to impart an insight into the internal structure and reproduction of the most evolved group of plants, the Angiosperm.
2. Identifies role of anatomy in solving taxonomic and phylogenetic problems.
3. Understand the structural adaptations in plants growing in different environment.
4. Understand the life cycle pattern of Angiosperms.

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5. Understand the morphology and development of reproductive parts.
6. Get an insight in to the fruit and seed development.

ANATOMY (Theory: 36 hours. Practical: 27 hours,)

Module-1_

2 hours

Scope and importance of Plant Anatomy

Interdisciplinary applications: - Histotaxonomy, Histochemistry, Pharmacognosy, Physiological Anatomy, Ecological Anatomy, Evolutionary trends in plant anatomy

Module -2_

6 hours

Study of Cell wall: Gross structure of primary and secondary cell walls, simple and bordered pits. Structure and function of plasmodesmata.

Submicroscopic structure of cell wall- Cellulose, micelle, micro fibril and macro fibril.

Different types of Cell wall thickening in tracheary elements

Extra cell wall thickening materials: - Lignin, cutin, suberin and callose.

Origin of cell wall; Growth of Cell wall- Apposition and intussusceptions – cavities & ducts, schizogenous & lysigenous developments

Non living inclusions in plant cell: - Reserve food materials -carbohydrate (starch), protein (Aleurone grain) and lipids (fats and oil);

Secretory products- pigments, enzymes and nectar.

Metabolic byproducts: - tannin, gums, resins, essential oils, mucilage, latex, mineral crystals and alkaloids

Module-3

7 hours

Tissues

Meristematic tissue- definition, structure, function and classification

Apical organization and theories; Shoot apex- Apical cell theory, Histogen theory and Tunica-Corpus theory.

Root apex - Histogen theory and Korper-Kappe theory.

Permanent Tissue: - Structure and function of simple and complex tissues.

Distribution and function of mechanical tissues in plants.

Plant fibres-economic importance.

Secretory tissues: - a). External secretory tissue- glands and nectaries, b). Internal secretory tissues- laticifers.

Module-4

7 hours

Tissue System- Structure and Function in root, stem and leaves.

a) Epidermal Tissue System- Epidermis, Cuticle, Trichome, Stomata, Bulliform cells, Cork and Silica cells.

b) Ground Tissue System- Cortex, Endodermis, Pericycle, Pith and Pith rays.

c) Vascular Tissue System- Different types of vascular bundles and their arrangement in

root and stem

Nodal anatomy- Leaf Trace, Leaf gap, Branch trace and Branch gap.

Module-5.

3 hours

Vascular cambium: - Development, structure and function, Activity of cambium, role of cambium in budding, grafting and wound healing.

Module-6.

8 hours

Normal secondary growth in dicot stem and root.

Wood anatomy- basic structure, heart wood, sap wood, hard wood, soft wood, growth rings and dendrochronology, porous and non porous wood, ring porous and diffuse porous wood, tyloses, knots.

Wood rays: Structure and cell types, uniseriate and multiseriate rays; heterocellular and homocellular rays.

Reaction wood- Tension wood and compression wood.

Properties, defects and seasoning of wood.

Stem thickening in monocots.

Periderm: Structure and development- phellum, phellogen, phelloderm, bark, polyderm, rhytidome and lenticel.

Module-7.

3 hours.

Anomalous secondary structure: *Bougainvillea* stem, *Bignonia* stem and *Dracaena* stem.

Practicals

27 hours

1. Cell types and tissues.

2. Non living inclusions – starch grains, cystolith, raphides, aleurone grains.

3. Primary structure of stem root and leaf-Dicots and Monocots.

4. Stomatal types: - anomocytic, anisocytic, paracytic, diacytic and grass type.

5. Secondary structure of dicot stem and root.

6. Anomalous secondary structure of *Bougainvillea* stem, *Bignonia* stem and *Dracaena* stem.

Reproductive Botany

(Theory-18 hrs. Practical -9 hrs,)

Module-1

2 hours

Introduction: - General account and interdisciplinary relevance of embryology , embryology in relation to taxonomy; experimental embryology.

Module-2 2 hours___

Life cycle of Angiosperms.

Floral morphology- parts of flower; androecium-morphology and types of anthers; gynoecium- morphology and types of carpel and types of placentation.

Module-3 4 hours

Structure and development of anther, microsporogenesis, development of male gametophyte, dehiscence of anther, structure of pollen, pollen germination, pollen tube growth and pollen viability.

Module-4 3 hours

Structure and development of ovule, megasporogenesis, embryosacs-monosporic (polygonum type), bisporic (Allium type) and tetrasporic (Peperomia type). Structure of mature embryo sac.

Module-5 3 hours

Pollination mechanisms and agencies of pollination; pollen stigma interaction; compatibility and incompatibility; syngamy and fusion; apomixis.

Module-6 4 hours

Development of endosperm and embryo in Dicots and Monocots; Polyembryony; Development and general structure of fruits(dry and fleshy) and seed.

Practicals 9 hours

1. Identification of C.S. of anther, embryo sac and embryo.
2. Identification of various anther types-monothealous, dithealous
3. Identification of placentation types.
4. Observation of pollen and locating pollen pore
5. Pollen germination study

Suggested Additional Topics

Applied Anatomy: Wood anatomy and identification of wood;

Wood fibres and Economic uses, Food fibers

Internal Structure of fruits, seeds and vegetables.

Cellulose fibre source and use in paper industry- Pulp and paper manufacture.

Fruit and leaf abscission

Electron microscopic structure of plant parts and their application in different branches of plant science

References

1. Ashok Bendra and Ashok Kumar, 1980. *Economic Botany*. Rastogi Publication, Meerut.
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MAHATMA GANDHI UNIVERSITY

B.Sc. BOTANY PROGRAMME

Semester IV

Course-4

BO4B04U

MICROBIOLOGY AND PHYCOLOGY

(Theory: 54 hours; Practical: 36)

(Theory Credit 3, Practical

Credit1)

Course objectives

Enable the student to

1. Understand the world of microbes
2. Understand the identifying characters of the lower groups of plants

3. Have an idea on diverse groups of plants
4. Understand the application of microbiology in different fields.

MICROBIOLOGY (Theory: 20hours; Practical: 12 hours)

Module 1 **1**
hour

Introduction, Scope of Microbiology

Module 2 **8 hours**

- Bacteria - Morphology and classification based on staining, morphology and flagellation
- Fine structure - cell wall - Peptido glycan- cytoplasm - Nucleoid, Flagella
- Reproduction- Binary fission
- Genetic recombination - Conjugation, transformation & transduction
- Archaeobacteria, Mycoplasma - general characters

Module 3 **6**
hours

Virus- General composition and properties - Architecture of TMV, HIV and Bacteriophages ,Multiplication and transmission.

Module 4 **5 hours**

Applied Microbiology

1. Role in Nitrogen cycle.
2. Biofertilizers & Bio pesticides.
3. Biogas production.
4. Reconversion of waste products.
5. Bioremediation.
6. Spoilage and preservation of food.
7. Antibiotics.
8. Production of Vinegar, curd, Yoghurt, single cell protein and Probiotics.
9. Bio reactors.

PRACTICAL **12 hours**

Students are expected to do the following practical

1. Preparation of bacterial smear.
2. Grams staining.
3. Isolation of microbes from soil (Dilution plate method).

PHYCOLOGY (Theory: 34 hours ; Practical: 24 hours)

Module 1 **3 hours**

Introduction - General characters of algae. Classification (Fritsch F. E, 1935; 1945.

Module 2 **20 hours**

General characters of the following major groups with special reference to the structure , reproduction and life cycles of the following types.

- a. Cyanophyceae: *Nostoc*
- b. Chlorophyceae: *Chlamydomonas, Volvox, Spirogyra, Oedogonium, Cladophora, Chara*
- c. Xanthophyceae: *Vaucheria*
- d. Bacillariophyceae: *Pinnularia*
- e. Phaeophyceae : *Sargassum*
- f. Rhodophyceae : *Polysiphonia*

Module 3 **9 hours**

Economic importance

- a. Algae as pollution indicator and in waste water treatment
- b. Commercial products: Agar, Alginates, Carrageenin, Diatomaceous earth
- c. Algae in soil fertility, Fertilizer, Nitrogen fixation, minerals, soil algae and symbiosis
- d. Sources of food & medicine
- e. Diatoms and nanotechnology
- f. As a source of Hydrogen as fuel
- g. Toxic algae – Algal blooms, red tides & fish poisoning
- h. Algae as primary producers – Oxygen liberators
- i. Cyanobacteria as a source of restriction endonuclease
- j. Role of algae in aquaculture.

Module 4 **2 hours**

Algal culture: scope and methods

Practicals **24 hours**

1. Make micro preparation of vegetative and reproductive structures of the types mentioned in the syllabus.

2. Identify the algal specimens up to the generic level by noting their key characters.
3. Make labeled sketches of the specimens observed.

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16. . Mamatha Rao, 2009, *Microbes and Non flowering plants- impact and application* Ane Boops Pvt Ltd.

websites

<http://www.phycology.net/>

<http://www.algaebase.org/>

<http://www.seaweed.ie/>

<http://www.brphycsoc.org/> (the british phycological society)

<http://www.intphycsoc.org/> (international phycological society)

<http://www.isaseaweed.org/> (the international seaweed association)

<http://botany.si.edu/projects/algae/>

<http://botany.si.edu/projects/algae/> (Smithsonian national museum of natural history)

MAHATMA GANDHI UNIVERSITY B.Sc. BOTANY PROGRAMME

Semester V Course-5 B05B05U
MYCOLOGY, LICHENOLOGY AND PLANT PATHOLOGY
(Theory: 36 hours; Practical: 45 hours) (Theory Credit 2, Practical Credit 2)

Course Objectives

Enable the student to

1. Understand the diversity of fungal and lichen world and its significance.
2. Understand the various plant diseases and their impact on agriculture.
3. Familiarize with the various measures adopted to control plant diseases.

I MYCOLOGY

(Theory 24 hours; Practical : 36 hours)

Module 1

15 hours

1. Introduction , structure, reproduction, life cycle, evolutionary trends.
Classification based on Ainsworth (1973)
2. Distinguishing characters of different classes of fungi with special reference to reproductive structures and life history of the genera mentioned in each group
 - a) Myxomycotina – General Characters
 - b) Mastigomycotina – *Albugo*
 - c) Zygomycotina - *Rhizopus*
 - d) Ascomycotina
 - * Hemiascomycetes -- *Saccharomyces*
 - * Plectomycetes -- *Pencillium*
 - * Pyrenomycetes – *Xylaria*
 - * Discomycetes -- *Peziza*
 - e) Basidiomycotina
 - * Teliomycetes ---*Puccinia*
 - * Hymenomycetes—*Agaricus*
 - f) Deuteromycotina – *Fusarium*

Module 2

7 hours

1. Economic importance of Fungi –useful and harmful aspects.
2. Fungi of Agricultural importance –mycoherbicides, myconematicides , mycoparasites , Mycorrhiza –diversity , function and significance.
3. Fungal biotechnology- Fundamental principles.
Mushrooms- edible and poisonous types.
cultivation technique-Spaw production .
Cultivation of Oyster mushroom.

II LICHENOLOGY

hours

2

Module 1

General account , economic and ecological importance of lichen
Structure, reproduction and life cycle of *Parmelia*.

PRACTICALS

36 hours

1. Students are expected to identify the following types by making suitable micropreparations and make labeled sketches *Rhizopus* , *Albugo* , *Saccharomyces*, *Pencillium* , *Xylaria*, *Peziza*, *Puccinia*, *Fusarium* and *Parmelia*.
2. Isolation and culture of Oyster mushroom mycelium.
- 3 Preparation of bed for mushroom cultivation.
4. Staining of endomycorrhiza / fungus.
5. Isolation of fungus from dung, air ,fruits ,vegetables.
6. Slide culture technique of fungus.

III PLANT PATHOLOGY

(Theory 12 hours; Practical : 9 hours)

Module 1

4 hours

History of plant pathology, Classification of plant diseases on the basis of causative organism and symptoms , Host parasite interaction , Defense mechanism in host ,Mechanism of infection, transmission and dissemination of diseases.

Module 2

2 hours

Control of plant diseases –

Prophylaxis-quarantine measures, seed certification

Therapeutic – physical therapy , chemotherapy.

Biological control.

Module 3

5

hours

Study of following diseases with emphasis on symptoms, disease cycle and control

Bunchy top of Banana.

Bacterial blight of Paddy.

Root wilt of Coconut.

Abnormal leaf fall of Rubber .

Fungicides - Bordeaux mixture, Tobacco Neem decotion, preparation. (Brief account only)

Module 4

1

hours

Medical mycology- Mention about fungal infections of man – Fungal allergens Athlete's foot, aspergillosis, candidosis, aflatoxin

Practicals

9 hours

Students are expected to :

1. Identify the diseases mentioned in the syllabus with respect to causal organisms and symptoms
2. Submit herbarium preparations of various stages (3stages) of any one of the diseases mentioned.
3. Students should be trained to prepare the fungicide – Bordeaux mixture, Tobacco decoction .

Suggested Additional Topics

Fungal ecology- details of fungal decomposition of organic matter , coprophilous fungi, cellulolytic fungi, lignin degrading fungi ,details of wood decay. soil fungi
Plant diseases, Role of enzymes in pathogenesis.

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MAHATMA GANDHI UNIVERSITY

B.Sc. BOTANY PROGRAMME

Semester V Course 6 B05B06U

ENVIRONMENTAL SCIENCE AND ECOTOURISM

(Theory :54 hours; Practical : 45hours) (Theory Credit 3, Practical Credit1)

Course Objectives:

1. Acquaint the student with the significance of Environmental Science.
2. Help the students to understand the extent, limitations and depletion of natural resources
3. Help the student to design novel mechanism for the sustainable utilization of natural resources.
4. Enable the students to understand the structure and function of the Ecosystems

5. Make the students to identify the nature and interactions of populations in the ecosystem
6. Enable the students to understand various kinds of pollution in the environment, their impacts on the ecosystem and their control measures
7. Make the students aware about the nature and structure of various environmental laws in India
8. Make the students aware about the role of various movements in the protection of nature and natural resources.
9. Make the students aware about the extent of the total biodiversity and their conservation.
10. Make the students to assess the positive and negative impacts of Ecotourism and its role in the sustainable utilization of resources for tourism.

ENVIRONMENTAL SCIENCE

48 hours

Module 1

1 hour

Environmental science and its multidisciplinary nature

Introduction, relevance and scope, public awareness

Module 2

6 hours

Natural Resources

- Types of resources-renewable and non renewable
- Forest resources: Timber extraction, mining, dams, over exploitation, deforestation, MFP (minor Forest products) , Joint Forest Management (JFM)
- Water resources: surface and ground water, drinking water, dams-benefits and problems, conflict over water, Rain water harvesting, Water shed conversation
- Food resources: major food crops in India. Causes of food shortage. Food security, world food problems.
- Energy resources: Energy plantation, - *Jatropha*
- Land resources: Land use, land degradation, desertification, EFL(Ecologically Fragile Land)
- Conservation of natural resources, ecological footprints

Module 3

10 hours

Ecosystems:

- Structure and function of ecosystem: Ecosystem components- abiotic and biotic, Productivity – primary and secondary-gross and net productivity. Decomposition in nature, homeostasis in ecosystem
- Ecological energetics: energy flow, trophic levels, food chain and food web, ecological pyramids
- Nutrient cycles: Biogeochemical cycles of C, N and S.

Module 4

4 hours

Community ecology

- Population: size, density, natality, mortality.
- Community characteristics: Species diversity and species richness, dominance, growth forms and structure, trophic structure.
- Association of communities: plant association, ecotypes, ecotone, edge effect, ecological indicators.
- Ecological succession: types of succession, process – migration, ecesis, colonization, stabilization and climax community; hydrosere, xerosere, lithosere.

Module 5

4 hours

Plants and environment

Ecological complexes and factors affecting plants growth and response:

- Climatic factors: temperature and pressure; water - precipitation, humidity, soil water holding capacity; light - global radiation.
- Topographic factors: altitude and aspects
- Edaphic factors - profile and physical and chemical properties of soil
- Biotic factors: interactions – positive and negative.

Species – ecosystem interaction: Habitat, ecological niche, microclimate

Adaptation of plants to environment: To Water- Xerophytes, Hydrophytes; Temperature – thermo periodicity, vernalization; light – photoperiodism, heliophytes, sciophytes; salinity – halophytes, mangroves.

Module 6

Environmental pollution and Management

12 hours

- Definition and general introduction
- Air pollution: Causes and sources, types of pollutants-particulates-aerosol, mist, dust, smoke, fume, plume, fog, smog. Effect of air pollution on plants and animals, Bhopal Gas Tragedy.
- Water pollution: Sources and types of pollutants. Water quality standards, water quality assessment. Ground water pollution-blue baby syndrome. Cycling of heavy metals, hydrocarbons. Eutrophication, BOD, Minamata disease.
- Soil pollution: Causes and sources-waste dumps, municipal wastes, agrochemicals, mining, solid waste management-vermi composting.
- Noise pollution: Sources, standards and measurements, effect on health, control techniques.
- Thermal pollution: Sources and effects
- Nuclear hazards: Sources and impacts.
- EIA: Environmental Impact Assessment in polluted areas

Module 7

Social issues and the environment:

2 hours

Climate change, global warming and green house gases, IPCC, Acid rain, Ozone layer depletion, nuclear accidents and nuclear holocaust.

Module 8

Environmental legislation and laws:

1 hour

(1) Environment (protection) Act, 1986, (2) Air (Prevention and control of pollution) Act, 1981, (3) Water (Prevention and control of pollution) Act, 1974, (4) Wildlife (protection) Act, 1972, (5) Forest (Conservation) Act, 1980 (briefly).

Module 9

6 hours

Biodiversity and Conservation biology:

- Endemism: Definition-types-factors. Hotspot of endemism-hotspots in India. IUCN-threat categories. Red data book., Western Ghats as the hottest spot and its conservations.
- Biodiversity loss: Causes and rate of biodiversity loss, extinction-causes. Alien species, negative and positive impacts
- Conservation efforts: Rio Earth Summit, Agenda 21, Kyoto protocol, COP 15(15th Conference of the Parties under the U N Framework Convention on Climate Change), IPCC (Inter Governmental Panel for Climate Change) and its contribution. Conservation strategies and efforts in India and Kerala, In situ and ex situ conservation methods. Role of NGOs in biological conservation

Module 10

2 hours

Organizations, movements and contributors of Ecological studies

- *Organizations:* BNHS, WWF, CSE, NEERI, , MoEF, Green Peace, Chipko
- *Famous contributors of Ecology in India:* Salim Ali, M.S. Swaminathan, Madhav Gadgil, M.C. Mehta, Anil Agarwal, Medha patkar, John C. Jacob, Sunderlal Bahuguna

ECOTOURISM:

6 hours

Definition, concept, introduction, history, relevance and scope. Components of ecotourism: Forms and types of ecotourism in India and Kerala, ecotourism resources-biological, historical, cultural, and geographical. Ecotourism centers in Kerala. Positive and negative impacts of ecotourism.

Practicals –

45 hours

1. Estimation of CO₂, Cl, and salinity of water samples (Titremetry)
2. Determination of pH of soil and water
3. Assessment of diversity, abundance, and frequency of plant species by quadrat method (Grasslands, forests)
4. Study of the most probable number (MPN) of coliform bacteria in water samples
5. EIA studies in degraded areas (Sampling – line transect, Quadrat)
6. Visit to any forests types including grasslands and preparation of the list of Rare and threatened (R&T) plants (no collection of specimens)
7. Collection, identification and preparation of the list of exotic species in the locality.
8. Identification of pollutant to respective pollution types.
9. Study of anatomical, morphological, physiological adaptation of plants to the environment (Xerophytic, Hydrophytic, Epiphytic, Halophytic).
10. Collection and recording of rain data by using simple rain gauge.

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MAHATMA GANDHI UNIVERSITY

B.Sc. BOTANY PROGRAMME

Semester V Course 7 BO5B07

GENETICS, PLANT BREEDING AND HORTICULTURE

(Theory 54 hours ; Practical 45 hours) (Theory Credit 3, Practical Credit1)

Course Objectives

- 1.** Understand the basic principles of heredity
- 2.** Understand the inheritance pattern of nuclear and extra nuclear genes
- 3.** Understand the methods of crop improvement
- 4.** Understand the importance of horticulture in human welfare

GENETICS

(Theory 25 hrs)

Module 1.

2 hours

Origin of a new branch of Biology- Genetics- Mendelian era; basic laws of inheritance, Mendelian ratios

Module 2.

8 hours

Growth of Genetics- post Mendelian period- modified Mendelian ratios; incomplete dominance-flower color in *Mirabilis*: Interaction of genes- comb pattern in poultry (9:3:3:1): Epistasis- recessive- coat color in mice (9:3:4); dominant epistasis- fruit color in summer squash (12:3:1): complementary genes- flower color in *Lathyrus* (9:7).

Module 3.

2 hours

Multiple alleles- general account: ABO blood group in man; co dominance; self sterility in *Nicotiana*.

Module 4

2 hours

Quantitative characters- polygenic inheritance, continuous variation- kernel color in wheat; ear size in maize.

Module 5

4 hours

Linkage and crossing over- importance of linkage, linkage and independent assortment. Complete and incomplete linkage. Crossing over- general account, cytological basis of crossing over- two point test cross;

determination of gene sequences; interference and coincidence; mapping of chromosomes.

Module 6

4 hours

Sex determination- sex chromosomes and autosomes- chromosomal basis of sex determination; XX-XY, XX-XO mechanism; sex determination in higher plants (*Melandrium album*); genic balance theory of sex determination in *Drosophila*; sex chromosomal abnormalities in man- Down's syndrome, Klinefelter's syndrome, Turner's syndrome- Sex linked inheritance- eye color in *Drosophila*, Haemophilia in man; Y-linked inheritance.

Module 7

2 hours

Extra nuclear inheritance- general account- maternal influence- plastid inheritance in *Mirabilis*, cytoplasmic male sterility in plants, kappa particle in *Paramecium*.

Module 8

1 hour

Population genetics-Hardy Weinberg law

PLANT BREEDING

(Theory: 15hours)

Module 1

2 hours

Introduction and objectives of plant breeding; methods of plant breeding

Module 2 3 hours

Plant introduction- procedure of plant introduction, quarantine regulations, acclimatization- agencies of plant introduction in India, major achievements..

Module3 2 hour

Selection- mass, pureline, clonal- genetic basis of selection-achievements.

Module 4 6 hours

Hybridization- procedure- intergeneric, interspecific and intervarietal hybridization.with examples- composite and synthetic varieties- heterosis in plant breeding, inbreeding depression; genetics of heterosis and inbreeding depression; single cross, pedigree method, bulk population method, multiple cross, back cross, polyploidy breeding, male sterility in plant breeding. Use of apomixis in plant breeding.

Module 5 2 hours

Mutation breeding- methods- achievements in India; breeding for pest, disease and stress resistance

HORTICULTURE (Theory: 14 hours)

Module 1 2 hours

Introduction to horticulture- definition, history, classification of horticultural plants, disciplines of horticulture; Garden tools and implements. Irrigation methods- surface, sub, drip and spray irrigations, mist chambers- advantages and disadvantages

Module 2 6 hours

Propagation of horticultural plants- by seeds- Seed viability, seed dormancy, seed testing and certification, seed bed preparation, seedling transplanting, hardening of seedling; advantages and disadvantages of seed propagation. Vegetative propagation- organs used in propagation- natural and artificial vegetative propagation; methods- cutting, layering, grafting and budding; advantages and disadvantages of vegetative propagation.

Module 3 6 hours

Gardening- ornamental gardens, indoor gardens, kitchen gardens- terrestrial and aquatic gardens- garden adornments; garden designing- garden components- lawns, shrubs and trees, borders, hedges, edges, walks, drives- famous gardens of India; Landscape

architecture- home landscape design, parks. Physical control of plant growth- training and pruning; selection of plant for bonsai, bonsai containers and method of bonsai formation

Practical

45 hours

A. Genetics

27 hours

a. Students are expected to work out the problems in:

1. Monohybrid , dihybrid cross and back crosses.
2. All types of modified Mendelian ratios mentioned in the syllabus.

b. Study of human karyotype and study of characteristic karyotypes and symptoms of the syndromes mentioned in the syllabus

B. Plant breeding

9 hours

1. Emasculation and bagging
2. Comparison of percentage of seed germination and the effect of any one chemical on the rate of elongation of radicle in any three crop seeds

C. Horticulture

18 hours

1. Tongue grafting, budding ('T' and patch), air layering
2. Identification of different garden tools and their uses
3. List out the garden components in the photograph of the garden given
4. Preparation of potting mixture in the given proportion

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MAHATMA GANDHI UNIVERSITY
B.Sc. BOTANY PROGRAMME
Semester V Course 8 B05B08U
CELL MOLECULAR BIOLOGY AND EVOLUTION
(Theory: 54 hours; Practical : 45 hours) (Theory Credit 3, Practical Credit1)

Objectives

1. Understand the Ultra structure and functioning of cell in the submicroscopic and molecular level.
2. Get an idea of origin, concept of continuity and complexity of life activities.
3. Familiarization of life process.
4. Understand the basic and scientific aspect of diversity.
5. Understand the cytological aspects of growth and development.
6. Understand DNA as the basis of heredity and variation.
7. Understand the concept of evolution as the basis of biodiversity.

Module – I

CELL BIOLOGY

28 hours

Unit 1. Historical account of cell Biology	1 hours
Cell theory	
Protoplasm theory	
Unit 2. Cell	8 hours
The physio-chemical nature of plasma membrane and cytoplasm Eukaryotic, Prokaryotic cell.	
The ultra structure of plant cell with brief description and function of the following organelles-Endoplasmic reticulum, Plastids, Mitochondria, Ribosomes, Dictyosome, Microbodies, lysosomes. Vacuole and cell sap, Nucleus - ultra structure, nucleolus structure and function.	
Unit 3 Chromosomes	15 hours
Morphology - fine structure Dupraw model - Nucleosome model – chemical organization of nucleosome – nucleoproteins, karyotype and idiogram; Special type of chromosomes - salivary gland ,Lampbrush and B chromosome. Cell cycle, mitosis, meiosis: significance of mitosis and meiosis. Change in number of chromosomes -Aneuploidy and Euploidy	
Change in the structure of chromosomes - Chromosomal aberrations deletion, duplication, inversions and translocations. Meiotic Behaviour of chromosomes.	
Unit 4 Mutations	2 hours
Spontaneous and induced. Mutagens- Physical and Chemical mutagens.	

Chromosomal and point mutations. Molecular mechanism of mutation - Transition, Transvesion and Substitution.

Unit 5 Stem cells; definition, sources and applications. 2 hours

Module – II 17 hours

MOLECULAR BIOLOGY

Unit1. Nucleic acids - structure of DNA and RNA - basic features, alternate forms of DNA - types and structure of RNA 3hrs.

unit2. Replication of DNA - Meselson-Stahl experiment - details of semiconservative replication of DNA 3 hrs.

unit3. Gene expression - concept of gene, definitions - the central dogma - details of transcription in procaryotes and eucaryotes - RNA prosscening.details of translation - genetic cod features 6hrs.

unit4. Control of gene expression - positive and negative control - operon model - lac operon, trp operon -attenuation 3hrs

unit5. Genetic basis of cancer - oncogenes - tumor suppressor genes - metastasis -2hrs

Module – III

EVOLUTION

9 hours

Unit 1 Introduction, Progressive, Retrogressive, Parallel and Convergent evolution. Theories of evolution - Lamark's, Darwin's, Weisman's and De Vries.

4 hours

Unit 2 Neo Darwinism

5 hours

Reproductive isolation, Mutation, Genetic drift, Speciation. Variation and evolution, hybridization and evolution, Polyploidy and evolution. Mutation and evolution.

Practicals

45 hours

1. Make acetocarmine squash preparation of onion root tip to identify mitotic stages.
2. Study the Mitotic Index of onion root tip cells
3. Study of meioses in any flower bud by smear preparation of PMC's
4. Identification of Barr body
5. PTC Testing
6. Identification of salivary gland chromosome.
7. Identify and study photographs and diagrams of cell division anomalies like lagging chromosomes, chr. bridge, aneuploidy, polyploidy. study the chromosomal patterns/ Karyotype in auto-, allo-, and aneuploids
8. Work out elementary problems based on DNA structure and replication

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MAHATMA GANDHI UNIVERSITY

B.Sc. BOTANY PROGRAMME

Semester VI

Course 9

BO6B09

PLANT PHYSIOLOGY AND BIOCHEMISTRY

(Theory 54: hours; Practical : 45 hours)

(Theory Credit 2, Practical Credit 2)

Course objectives

1. Understand the basic principles related to various physiological functions in plant life.
2. Familiarize with the basic skills and techniques related to plant physiology.
3. Understand the role, structure and importance of the bio molecules associated with plant life.
4. Familiarize with the recent trends in the field of plant physiology.
5. Familiarize with applied aspects of plant physiology in other fields like agriculture.

PLANT PHYSIOLOGY (Theory 36: hours; Practical : 33 hours)

MODULE -I 6 hours

Water relations

- A. Physical aspects of absorption-Diffusion, imbibition, osmosis, OP, DPD, TP, WP, Concept of Water potential, matrix potential, pressure potential.
- B. Absorption of water-active & passive, Ascent of sap-cohesion adhesion theory, Transpiration-types-mechanism-theories-(starch-sugar, proton-K+ion exchange)-significance – antitranspirants, Guttation.

MODULE II 3hours

Mineral Nutrition and mechanism of absorption.

Essential and non essential elements- macro& micro- role- deficiency symptoms.
Absorption of minerals– active & passive-ion exchange, carrier concept.

MODULE III 10 hours

Photosynthesis

History - Photosynthetic pigments, photo excitation- Fluorescence, Phosphorescence - Absorption and action spectra, Red drop and Emerson enhancement effect, Concept of photo systems, Cyclic & Non Cyclic photophosphorylation, Carbon assimilation pathways- C₃, C₄, CAM- Photorespiration –factors affecting photosynthesis.

MODULE - IV 2 hours

Translocation of solutes

Pathway-phloem transport-mechanism-pressure flow-phloem loading and unloading.

MODULE – V 8 hours

Respiration

Aerobic and Anaerobic, Glycolysis, Krebs cycle, Electron transport system & Oxidative phosphorylations, ATPases - chemi osmotic hypothesis-RQ –significance-factors affecting respiration.

MODULE – VI 1hour

Plant responses to environment

Allelochemicals- herbivory

MODULE – VII 4hours

Physiology of growth and development

- A. Physiological effects and practical application of hormones-Auxins, Giberillins, Cytokinins, ABA, ethylene.
- B. Physiology of flowering–phytochrome-photoperiodism-vernalisation

MODULE – IX

2 hours

Stress physiology

Abiotic-concept of plant responses to water, salt and temperature stresses-
Biotic- pathogens

BIO-CHEMISTRY (Theory 18: hours; Practical : 12 hours)

MODULE - I

2 hours

Water, Solutions & pH

Physical and chemical properties of water, Acid and bases, pH definition, significance, measurement, pH indicators, buffer action, pH and life.

MODULE – II

10 hours

Chemistry of biological molecules

Carbohydrates- structure and role of mono-di & poly-saccharides-common sugars seen in plants

Proteins-peptide bond-essential and non essential amino acids-primary structure-physiologically important proteins.

lipids - general features and their roles - fatty acid types and structure - fatty acid derivatives- fats and oils, structure and functions - compound lipids

MODULE – III

Enzymes

6 hours

Nomenclature, characteristics mechanism and regulation of enzyme action, enzyme kinetics, factors affecting enzyme action.

Plant physiology Practical

(33 hours)

Core Experiments

1. Determination of osmotic pressure of plant cell sap by plasmolytic method.
2. Compare the stomatal indices of hydrophytes, xerophytes and mesophytes.
3. Separation of plant pigments by thin layer chromatography (TLC) and paper chromatography.
4. Measurement of photosynthesis by Willmott's bubbler/any suitable method.
5. Estimation of plant pigments by colorimeter.

Demonstration only- experiments.

1. Papaya petiole osmoscope.
2. Demonstration of tissue tension.
3. Relation between transpiration and absorption.
4. Necessity of chlorophyll, light and CO₂ in photosynthesis.
5. Simple respiroscope
6. Respirometer and measurement of R.Q.
7. Fermentation.
8. Measurement of transpiration rate using Ganong's photometer/ Farmer's Potometer.

Biochemistry – Practical.

12 hours

1. General test for carbohydrates- Molisch's test, Benedict's tests, Fehling's test.
2. Colour test for starch – Iodine test.
3. Colour tests for proteins in solution. Biuret test, Million's test, Ninhydrin test.
4. Detect the presence of any three major organic compounds in the given food stuff/material viz. reducing /non-reducing sugar/fat proteins/starch.sucrose.
5. Action of various enzymes in plant tissues: peroxidases, dehydrogenase.
6. Estimation of protein using colorimeter.

Suggested additional topics

1. Mycorrhizae
2. Chelating agents
3. Photosynthetic rates, efficiencies and crop production.
4. Pentose phosphate pathway.
5. Nitrogen fixation.
6. Plant protective coats –cutins ,waxes and suberin.
7. Senescence and abscission.
8. Circadian rhythms.

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MAHATMA GANDHI UNIVERSITY

B.Sc. BOTANY PROGRAMME

Semester VI

Course 10

BO6B010U

BRYOLOGY, PTERIDOLOGY, GYMNOSPERMS & PALEOBOTANY

(Theory: 54 hours ;Practical :45 hours)

(Theory Credit 3, Practical Credit1)

Course objectives

1. Understand the diversity in habits, habitats and organization of various groups of plants.
2. Understand the evolutionary trends in plants.
3. Identify the anatomical variations in lower groups of plants.
4. Understand the significance of Paleobotany.

BRYOLOGY

(Theory: 16 hours ;Practical :15 hours)

Module 1

2 hours

Introduction, general characters, classification, Evolution of Bryophytes.

Module 2

12 hours

Morphology, anatomy and reproduction in *Riccia*, *Lunularia*, *Anthoceros* and *Funaria*.

Evolution of sporophyte and gametophyte (Development of sex organs not necessary).

Module 3 2 hours

Importance of Bryophytes, Prevention of soil erosion, pollution monitoring and control, Antibiotics, Horticultural importance.

Practical 15 hours

Make micro preparations of the types mentioned. Study vegetative and reproductive structures.

PTERIDOLOGY (Theory:16 hours ; Practical :18 hours)

Module 1 2 hours

Introduction, general characters, classification, evolution of Pteridophytes.

Module 2 14 hours

Structural organization of sporophyte and gametophyte (devt. of sex organs not necessary) of the following types with special reference to stelar structure, heterospory and seed habit.

1. *Psilotum*
2. *Lycopodium*
3. *Selaginella*
4. *Equisetum*
5. *Pteris*
6. *Marsilea*

Practicals 18 hours

Make micropreparations to study stelar structure and sporangia of the mentioned types.

Identify at sight, noting the morphology.

GYMNOSPERMS (Theory: 14 hours ; Practical :12 hours)

Module 1 2 hours

Introduction, general characters, classification, origin and evolutionary significance

Module 2 12 hours

Study of morphology, anatomy and reproductive features of *Cycas*, *Pinus* and *Gnetum*.

Practical 12 hours

Study of the morphology, anatomy and reproductive structures of the types mentioned.

PALAEOBOTANY (Theory: 8 hours)

Module 1 3 hours

Introduction, Study of geological time scale, formation of fossil, fossil types & technique of study, fossil as a fuel.

Module 2

4 hours

Detailed study of

Fossil Pteridophyte : *Rhynia*

Fossil Gymnosperm: *Williamsonia*

Fossil Angiosperm : *Palmoxyton*

Indian contribution to Palaeobotany

1 hour

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<http://bryophytes.plant.siu.edu/>

<http://worldofmosses.com/>

<http://www.unomaha.edu/~abls/>

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<http://www.bryoecol.mtu.edu/>
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http://allwebhunt.com/cgi.cfm/Top/Science/Biology/Flora_and_Fauna/Plantae/Cycadophyta/Cycadopsida/Cycadaceae/Cycas
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MAHATMA GANDHI UNIVERSITY

B.Sc. BOTANY PROGRAMME

Semester VI

Course 11

B06B011U

ANGIOSPERM MORPHOLOGY,

SYSTEMATIC BOTANY AND ECONOMIC BOTANY

(Theory 54 hours; Practical : 45 hours)

(Theory Credit 3, Practical Credit1)

Course objectives:-

1. Acquaint with the aims, objectives and significance of taxonomy.
2. Identify the common species of plants growing in Kerala and their systematic position.
3. Develop inductive and deductive reasoning ability.
4. Acquaint with the basic technique in the preparation of herbarium.
5. Familiarizing with the plants having immense economic importance.

Module-1.

(Theory 6 hours; Practical : 6 hours)

The Board of Studies in Botany (U G), Mahatma Gandhi University, Kottayam

Floral morphology .

Unit 1

Morphology of flower

1. Parts of a flower- description of flower and it's parts in technical terms.
2. Flower as modified shoot.
3. Types of flower – Hypogyny, Perigyny and Epigyny, Symmetry of flowers.
4. Aestivation types.
5. Placentation types.
6. Floral Diagram and Floral Formula.

Unit 2

1. Inflorescence:-
 - (a) Racemose types-Simple Raceme, Corymb, Umbel, Spike, Spadix and Head.
 - (b) Cymose types-Simple Cyme, Monochasial- Scorpid and Helicoid, Dichasial
 - (c) Special type- Cyathium, Hypanthodium
2. Fruits: – Simple-Fleshy, Dry- dehiscent, indehiscent, Aggregate, Multiple(Sorosis and Syconus)

Module- 2.

(Theory 40 hours)

Systematic Botany

- | | |
|--|---------|
| Unit 1 Aim, Scope and Significance | 1 hour |
| Unit 2. Types of Classification- Artificial (Brief account), Natural – Bentham and Hooker(Detailed account) and Phylogenetic (Brief account) | 3 hours |
| Unit 3. Binomial Nomenclature, ICBN- Brief account | 1 hour |
| Unit 4. Interdisciplinary approach in Taxonomy- Cytotaxonomy and Chemotaxonomy. | 1hour |
| Unit 5 Herbarium technique- Preparation of herbarium, their preservation. Important herbaria, Botanical Gardens and BSI. | 2 hours |

Unit 6. Family studies: -

32 hours

Study the following families of Bentham and Hooker's System with special reference to their morphological and floral characters. Special attention should be given to common and economically important plants within the families

Annonaceae, Nymphaeaceae, Malvaceae, Sterculiaceae, Rutaceae, Meliaceae, Anacardiaceae, Leguminosae (Mimosaceae, Caesalpiniaceae and Fabaceae), Combretaceae, Myrtaceae, Cucurbitaceae, Apiaceae, Rubiaceae, Compositae (Asteraceae), Sapotaceae, Apocynaceae, Asclepiadaceae, Solanaceae, Convolvulaceae, Scrophulariaceae, Acanthaceae, Verbenaceae, Lamiaceae (Labiatae), Amaranthaceae, Euphorbiaceae, Orchidaceae, Liliaceae, Areaceae, Graminae (Poaceae)

Module- 3

(Theory 8 hours)

Economic botany

6 hours

Unit 1. Study of the following groups of plants based on their uses with special reference to the botanical name, family and morphology of the useful part

Cereals- Rice, Wheat

Millets- Ragi

Pulses- Green gram, Bengal gram, Black gram

Sugar yielding plants – Sugarcane

Fruits:- Apple, Pineapple, Orange, Mango and Banana

Vegetables:- Bittergourd, Ladies finger, Carrot and Cabbage.

Timber yielding plants:- Teak wood and Jack wood

Beverages- Tea, Coffee

Fibre yielding plants- Coir, Jute, Cotton

Oil yielding plants- Ground nut, Gingelly

Rubber yielding plants- Para rubber

Gums and Resins- White damer, Gum Arabic, Asafoetida

Spices – Cardamom, Pepper, Cloves , Ginger

Insecticide yielding Plants- Tobacco and Neem

Unit 2. Ethnobotany and it's significance.

2 hours.

Study of the following plants used in daily life by tribals and village folks for Food, Shelter and Medicine

Food :- *Artocarpus*, *Corypha*, *Phoenix*

Shelter - *Bamboosa*, *Ochlandra* and *Calamus*

Medicine - *Curcuma*, *Trichopus zeylanicus* and *Alpinia galangal*

Practicals

45 hours.

1. Identify the following inflorescence and fruits:-
 - (a) Inflorescence - Simple raceme, Spike, Corymb, Head, Dichasial cyme and Cyathium.
 - (b) Fruits - Simple: - Nut, Legume, Berry and Drupe Multiple and Aggregate
2. Preparation of floral formula from floral description.
3. Identify the families mentioned in the syllabus by noting their key, vegetative and floral characters.
4. Students must describe the floral parts, draw the L.S., floral diagram and write the floral formula of at least one flower from each family.
5. Study the finished products of plants mentioned in the syllabus of economic botany with special reference to the morphology, botanical name and family.
6. Prepare herbarium of 25 plants with field notes.
7. Conduct field work for a minimum of 5 days under the guidance of a teacher
8. Identify and describe the ethnobotanical uses of the items mentioned in the syllabus.

Suggested additional topics

1. Interdisciplinary approach in Taxonomy, Molecular taxonomy, Numerical taxonomy, Barcoding for species identification and Taxonomy for biodiversity characterization.
2. Binomial nomenclature- Historical account, ICBN, Principles and major rules in – Type concept, priority, valid publication, author citation.

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MAHATMA GANDHI UNIVERSITY

B.Sc. BOTANY PROGRAMME

Semester VI

Course 12

B06B012

BIOTECHNOLOGY AND BIOINFORMATICS

(Theory 54 hours; Practical : 45hours) (Theory Credit 3, Practical Credit1)

COURSE OBJECTIVES

1. Familiarize with the fundamental principles of biotechnology, various developments in biotechnology and potential applications.
2. Make aware that the life forms and activities can be exploited for human advancement.
3. Impart an introductory knowledge about bio informatics to the students.
4. Use of computers to handle biological data base.

BIOTECHNOLOGY

(Theory 36 hours ; Practical 26 hours)

Module-1

hours

10

1. Introduction – The concept of biotechnology, landmarks in biotechnology.
2. Plant tissue culture – Principles and techniques.

Cellular totipotency, *in vitro* differentiation –de differentiation and re-differentiation , callus induction, organogenesis and somatic embryogenesis.

3. Tissue culture medium – Basic components in tissue culture medium – Solid and liquid medium – suspension culture. Murashige and Skoog medium – composition and preparation. Aseptic techniques in tissue culture – sterilization – different methods – sterilization of instruments and glass wares, medium, explants; working principle of laminar air flow and autoclave; preparation of explants – surface sterilization. Inoculation, incubation, subculturing.
4. Micropropagation - Different methods – axillary bud proliferation, direct and indirect organogenesis and somatic embryogenesis. Different phases of micropropagation – hardening, transplantation and field evaluation Advantages and disadvantages of micropropagation. Somaclonal variation.

Module – 2

10 hours

1. *Methods and Applications* of tissue culture - Shoot tip and meristem culture Synthetic seed production, embryo culture, *In vitro* mutagenesis, Protoplast isolation culture and regeneration – transformation and transgenics, Somatic cell hybridization- cybrids. *In vitro* secondary metabolite production — cell immobilization, bioreactors *In vitro* production of haploids – anther and pollen culture, *In vitro* preservation of germplasm.

Module – 3

8 hours

Recombinant DNA Technology

Gene cloning strategies – recombinant DNA construction – cloning vectors – plasmids pBR322, bacteriophage based vectors, Ti plasmids. Restriction endonucleases and ligases – Ligation techniques, transformation and selection of transformants – using antibiotic resistances markers, southern blotting; PCR.

Different methods of gene transfer – chemically stimulated DNA uptake by protoplast, transduction, electroporation, microinjection, microprojectiles, *Agrobacterium* mediated gene transfer gene library ,gene banks.

Module – 4

3 hours

Application of Biotechnology in :

Medicine - Production of human insulin, human growth hormone and vaccines, gene therapy, monoclonal antibodies, biopharming.

Forensics - DNA finger printing.

Agriculture - Genetically modified crops – Bt crops, Golden rice, Flavr Savr

Tomato, Virus herbicide resistant crops, Edible vaccines.

Environment - Bioremediation- use of genetically engineered bacteria- super bug.

- Industry - Horticulture and Floriculture Industry, production of vitamins, amino acids and alcohol.

Module – 5

3 hours

Scope and relevance of the following technologies:
Microbial biotechnology, Tissue Engineering technology, Embryonic stem cell culture, animal cloning, Micro array technology, Bionanotechnology.

Module-6

2 hours

Social and ethical issues, biosafety , biowar, patenting and IPR issues.

PRACTICALS

32 hours

1. Preparation of nutrient medium – Murashige and Skoog medium, sterilization, preparation of explants, inoculation.
2. Extraction of DNA from plant tissue.
3. Immobilization of whole cells or tissues in sodium alginate.
4. Determination of appropriate flower bud containing uninucleate pollen for anther culture using cytological techniques
5. Study of genetic engineering tools and techniques using photographs/diagram (Southern blotting, DNA finger printing, PCR,)
6. Visit a well equipped biotechnology lab and submit a report along with the practical record.

BIOINFORMATICS

(Theory : 18 hours ; Practical : 10 hours)

Module-1

7 hours

1. Introduction to Bioinformatics, scope and relevance, genome, transcriptome, proteome.
2. Biological data bases –
Nucleotide sequence database – EMBL, Gen Bank, DDBJ.
Protein sequence database – PDB, SWISS PROT
Organismal database – *Saccharomyces* genome database

Biodiversity database – Species 2000

3. Information retrieval from Biological database, sequence alignment types and tools: pair wise sequence alignment multiple sequence alignment, use of BLAST, FASTA.

Module-2

6 hours

1. Genomics : DNA sequencing Sangers procedure-automation of DNA sequencing, genome sequence assembly, Genome projects – Major findings of the following genome projects – Human, *Arabidopsis thaliana*, Rice, *Haemophilus influenza*, Application of genome projects.
2. Proteomics : Protein sequencing- Edman degradation method, automation of sequencing, protein structure prediction and modelling (Brief account only)

Module-3

5 hours

A brief account on

1. Molecular phylogeny and phylogenetic trees.
2. Molecular visualization – use of Rasmol.
3. Molecular docking and computer aided drug design.

PRACTICALS

13 hours

1. Familiarizing with the different data bank mentioned in the syllabus.
2. Molecular visualization using Rasmol.
3. Blast search.

Suggested additional topics

Tissue culture and crop improvement, Genetic transformation and transgenics, Advances in crop biotechnology molecular markers-molecular biology tools in plant breeding, Gene and genome library, Terminator technology, Advances in microbial biotechnology, enzyme technology, Advances in animal biotechnology-stem cell research. Micro array Bioinformatics.

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6. Colin Ratledge and Bjorn Krishansen, 2008. *Basic Biotechnology*, Cambridge University Press.
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11. John E Smith 2006. *Biotechnology*, Cambridge University Press
12. Lewin. B. 2008 *Gene IX*. Jones and Barlett Publications.
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23. *Genomics, Proteomics & Drug Discovery* Prentice Hall of India Pvt. Ltd., New Delhi.
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Cambridge University Press, Foundation Books Pvt. Ltd., New Delhi.
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Wiley & Sons, Ltd. New York.
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in Molecular biology. Tata Mc Graw Hill Publishing Co.Ltd. New Delhi
30. Prasad. S, 2004, *Impact of Plant Biotechnology on Horticulture*. Agrobios India
31. Jin Xlong, 2009, *Essential Bioinformatics*, Cambridge.
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33. Cynthia Gibas and Per Jambeck, 2003, *Developing Bioinformatics Computer Skills*.
O'Reilly,

ENGLISH COMMON COURSE (I TO IV SEMESTER)

SYLLABI FOR COMMON COURSES

Course I: COMMUNICATION SKILLS IN ENGLISH

COURSE CODE	ENCN1
TITLE OF THE COURSE	COMMUNICATION SKILLS IN ENGLISH
SEMESTER IN WHICH THE COURSE IS TO BE TAUGHT	1
NO. OF CREDITS	4
NO. OF CONTACT HOURS	90

1. AIM OF THE COURSE

- To develop the students' ability to use English language accurately and effectively by enhancing their communication skills.

2. OBJECTIVES OF THE COURSE

- To introduce the students to the speech sounds of English in order to enable them to listen to English and speak with global intelligibility.
- To enable the students to speak English confidently and effectively in a wide variety of situations.
- To help the students to improve their reading efficiency by refining their reading strategies.

3. COURSE OUTLINE

MODULE – I

Speech Sounds

18 hours

Phonemic symbols - Vowels - Consonants - Syllables - Word stress - Stress in polysyllabic words – Stress in words used as different parts of speech - Sentence stress – Weak forms and strong forms – Intonation – Awareness of different accents: American, British and Indian – Influence of the mother tongue

MODULE – II

Listening

18 hours

Active listening – Barriers to listening – Listening and note taking– Listening to announcements – Listening to news on the radio and television

MODULE- III

Speaking

36 hours

Word stress and rhythm – Pauses and sense groups – Falling and rising tones – Fluency and pace of delivery – Art of small talk – Participating in conversations – Making a short formal speech – Describing people, place, events and things – Group discussion skills and telephone skills

MODULE – IV

Reading

18 hours

Reading: theory and Practice – Scanning - Surveying a textbook using an index - reading with a purpose – making predictions – Understanding text structure – Locating main points – Making inferences - Reading graphics - reading critically – Reading for research

4. CORE TEXT

V.Sasikumar, P Kiranmai Dutt and Geetha Rajeevan, . *Communication Skills in English*. Cambridge University Press and Mahatma Gandhi University.

FURTHER READING

Sl.No	Title	Author	Publisher & Year
1	<i>A Course in Listening and Speaking I & II</i>	Sasikumar V.,Kiranmai Dutt and Geetha Rajeevan	New Delhi: CUP, 2007
2	<i>Study Listening: A</i>	Tony Lynch	New Delhi:

	<i>Course in Listening to Lectures and Note-taking</i>		CUP, 2008
3	<i>Study Speaking: A Course in Spoken English for Academic Purposes</i>	Anderson, Kenneth, Joan Maclean and Tony Lynch	New Delhi: CUP, 2008
4	<i>Study Reading: A Course in Reading Skills for Academic Purposes</i>	Glendinning, Eric H. and Beverly Holmstrom	New Delhi: CUP, 2008
5	<i>Communication Studies</i>	Sky Massan	Palgrave Macmillan
6	<i>Effective Communication for Arts and Humanities Students</i>	Joan Van Emden and Lucinda Becker	Palgrave Macmillan

5. MODEL QUESTION PAPER
(To be incorporated)

SYLLABI FOR COMMON COURSES

Course II: READING LITERATURE IN ENGLISH

COURSE CODE	ENCN2
TITLE OF THE COURSE	READING LITERATURE IN ENGLISH
SEMESTER IN WHICH THE COURSE IS TO BE TAUGHT	1
NO. OF CREDITS	3
NO. OF CONTACT HOURS	72

1. AIM OF THE COURSE

To acquaint the learners with the different forms of literature and develop in them an ability to understand and appreciate literary pieces.

2. OBJECTIVES OF THE COURSE

- To sensitize students to the aesthetic, cultural and social aspects of literature.
- To develop in the learners an appreciation of the subtle nuances of literary expression.
- To enable the learners to revalue literature as cultural and communicative events.
- To improve the learners' use of language as a means of subjective expression.

3. OUTLINE OF THE COURSE

MODULE ONE: ESSAYS

(18 hours)

1. E.V. Lucas : **“Bores”**
2. Jawaharlal Nehru : **“A Glory has Departed”**
3. Amartya Sen : **“Tryst with Destiny”**

4. Bertrand Russell : **“How to Escape from Intellectual Rubbish”**

MODULE TWO: POETRY (18 hours)

1. William Shakespeare : Sonnet XXX
2. John Keats : **“Ode to the Nightingale”**
3. Robert Frost : **“Mending Wall”**
4. David Malouf : **“The Bicycle”**
5. Maya Angelou : **“Poor Girl”**
6. Kamala Das : **“The Mask”**
7. Nissim Ezekiel : **“Goodbye party for Miss Pushpa T.S”**
8. Gabriel Okara : **“Once Upon a Time”**

MODULE THREE: SHORT STORIES (18 hours)

1. Anton Chekov : **“The Lottery Ticket”**
2. O. Henry : **“Jimmy Valentine”**
3. R. K. Narayan : **“A Shadow”**
4. Anita Desai : **“A Devoted Son”**
5. A J Cronin : **“Two Gentlemen of Verona”**

MODULE FOUR: ONE-ACT PLAYS (18 hours)

1. Fritz Karinthy : **“Refund”**
2. Tennessee Williams : **“Lord Byron’s Love Letter”**
3. W W Jacobs : **“Monkey’s Paw”**

4. CORE TEXT

Dr Leesa Sadasivan Ed. *Reading Literature in English*. Foundation Books and Mahatma Gandhi University.

5. Model Question Paper (To be incorporated later)

SYLLABI FOR COMMON COURSES

Course III: CRITICAL THINKING, ACADEMIC WRITING AND PRESENTATION

COURSE CODE	ENCN3
TITLE OF THE COURSE	CRITICAL THINKING, ACADEMIC WRITING AND PRESENTATION
SEMESTER IN WHICH THE COURSE IS TO BE TAUGHT	2
NO. OF CREDITS	4
NO. OF CONTACT HOURS	90

1. AIM OF THE COURSE

- To develop the critical and analytical faculty of students and to improve their proficiency in reading, writing and presentation.

2. OBJECTIVES OF THE COURSE

- To make the students aware of the fundamental concepts of critical reasoning and to enable them to read and respond critically, drawing conclusions, generalizing, differentiating fact from opinion and creating their own arguments.
- To assist the students in developing appropriate and impressive writing styles for various contexts.
- To help students rectify structural imperfections and to edit what they have written.
- To equip students for making academic presentations effectively and impressively.

3. COURSE OUTLINE

MODULE – I

Critical Thinking

18 hours

Introduction to critical thinking – Benefits - Barriers – Reasoning - Arguments - Deductive and inductive arguments – Fallacies - Inferential comprehension- Critical thinking in academic writing - Clarity - Accuracy – Precision - Relevance

MODULE – II

Research for Academic Writing and the Writing Process **18 hours**

Data collection - Use of print, electronic sources and digital sources -
Selecting key points - Note making, paraphrasing, summary –
Documentation - Plagiarism – Title – Body paragraphs - Introduction and
conclusion – Revising - Proof-reading

MODULE – III

Accuracy in Academic Writing **18 hours**

Articles - Nouns and prepositions - Subject-verb agreement - Phrasal verbs
- Modals - Tenses - Conditionals – Prefixes and suffixes – Prepositions -
Adverbs – Relative pronouns - Passives - Conjunctions - Embedded
questions - Punctuation – Abbreviations

MODULE – IV

Writing Models **18 hours**

Letters - Letters to the editor - Resume and covering letters - e-mail -
Seminar papers - Project reports - Notices - Filling application forms -
Minutes, agenda - Essays

MODULE – V

Presentation Skills **18 hours**

Soft skills for academic presentations - Effective communication skills –
Structuring the presentation - Choosing appropriate medium – Flip charts
– OHP - PowerPoint presentation – Clarity and brevity - Interaction and
persuasion - Interview skills –Group Discussions

4. CORE TEXT

Marilyn Anderson, Pramod K Nayar and Madhucchandra Sen. *Critical Thinking, Academic Writing and Presentation Skills*. Pearson Education and Mahatma Gandhi University.

5. MODEL QUESTION PAPER

The Board of Studies in Botany (U G), Mahatma Gandhi University, Kottayam

(To be incorporated)

SYLLABI FOR COMMON COURSES

Course IV: MUSINGS ON VITAL ISSUES

COURSE CODE	ENCN4
TITLE OF THE COURSE	MUSINGS ON VITAL ISSUES
SEMESTER IN WHICH THE COURSE IS	2

TO BE TAUGHT	
NO. OF CREDITS	3
NO. OF CONTACT HOURS	72

1. AIM OF THE COURSE

- To provide an overall awareness about relevant societal and global issues through a critical reading of appropriate literary pieces.
- To inspire students to think critically about vital social issues that confront the contemporary world.

2. OBJECTIVES OF THE COURSE

At the end of the course,

- The students are expected to understand and evaluate issues that are of vital importance in today's world.
- The students will have acquired the ability to respond empathetically to social issues.
- They will be able to write literary and critical pieces on issues of social relevance.

3. OUTLINE OF THE COURSE

MODULE ONE: Globalization and its consequences (18 hours)

1. Fritjof Capra : "The Dark Side of Growth"
2. Joseph Stiglitz : "Globalization"
3. D H Lawrence : "Money Madness"
4. S Joseph : "For the Dispossessed"
5. Vandana Shiva : "The Social Costs of Economic Globalization"
6. Jagannath Prasad Das : "Kalahandi"

MODULE TWO: Human Rights (36 hours)

1. Leah Levin : "Universal Declaration of Human Rights"
2. Nani A Palkivala : "Human Rights and Legal Responsibilities"
3. Martin Luther King : "I Have a Dream"
4. Kalpana Jain : "Stigma, Shame and Silence"
5. Wole Soyinka : "Telephone Conversation"

6. Richard Wright : “Twelve Million Black Voices”
7. Aruna Roy : “Tune in to the Voice of the Deprived”
8. Johannes V. Jensen : “Lost Forests”
9. Omprakash Valmiki : “Joothan”

Note: “Peace and the New Corporate Liberation Theology” by Arundhati Roy is excluded.

MODULE THREE: Gender Questions (18 hours)

1. Jamaica Kincaid : “Girl”
2. Taslima Nasrin : “At the Back of Progress”
3. Judy Brady : “Why I Want a Wife”
4. J B Priestley : “Mother’s Day”
5. Amartya Sen : “More Than 100 Million Women are Missing

Note: “Widow” by Gudipat Venkat Chellam is excluded.

4. CORE TEXT

Dr P J George Ed. *Musings on Vital Issues*. Orient Blackswan and Mahatma Gandhi University.

5. Model Question Paper
(To be incorporated later)

SYLLABI FOR COMMON COURSES

Course V: REFLECTIONS ON INDIAN POLITY, SECULARISM AND SUSTAINABLE ENVIRONMENT

COURSE CODE	ENCN5
TITLE OF THE COURSE	REFLECTIONS ON INDIAN POLITY, SECULARISM AND SUSTAINABLE ENVIRONMENT
SEMESTER IN WHICH THE COURSE IS TO BE TAUGHT	3
NO. OF CREDITS	4
NO. OF CONTACT HOURS	90

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1. AIM OF THE COURSE

- To impart Gandhian values and to make the students positively respond to the concepts of secularism, democracy and love of nature.

2. OBJECTIVES OF THE COURSE

- To enable the students to grow into responsible citizens taking pride in the secular and democratic traditions of the country.
- To inculcate a cosmopolitan outlook in the students and to equip them to fight against the divisive forces in the society.
- To make the students aware of the consequences of mindless exploitation of nature.

3. OUTLINE OF THE COURSE

MODULE I: Readings on Indian Constitution and Federalism (18 hours)

1. The Preamble of the Constitution
2. Rajendra Prasad : “Let Posterity Judge”
3. Sebastian : “Exciting Views”
4. Amulal Hingorani : “Brother Abdul Rahman”

Note: “Dimensions of Indian Federalism” by Rajesh Kumar is excluded.

MODULE II: Readings on Gandhian Philosophy (18 hours)

1. Vallathol : “My Master”
2. Louis Fischer : “Gandhi and Western World”
3. Raja Rao : “The Cow of the Barricades”
4. M.K.Gandhi : “Round Table Conference Speech”
5. C E M Joad : “The Gandhian Way”

MODULE III: Readings on Secularism (18 hours)

1. Mohinder Sing Sarna : “Smaller Gandhis”
2. Kumar Vikal : “Can you Make Out”
3. Shashi Tharoor : “The Idea of India: India’s Mosaic of Multiplicities”
4. Ismat Chughtai : “Roots”
5. Padma Sachdev : “Smoke”

MODULE IV: Readings on Sustainable Environment (36 hours)

- Fritjof Capra : “Deep Ecology”
- A K Ramanujan : “Ecology”
- Sujatha Bhatt : “The First Meeting”
- Ramachandra Guha : “A Gandhian in Garhwal”
- Jack London : “The Law of Life”
- Elizabeth Bishop : “The Fish”
- Chief Seattle : “The End of Living and the Beginning of Survival”
- Robinson Jeffers : “The Last Conservative”
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4. CORE TEXT

Dr B Keralavarma Ed. *Understanding India: An Anthology on Indian Polity, Secularism and Sustainable Environment*. Macmillan and Mahatma Gandhi University.

5. Model Question Paper
(To be incorporated later)

Syllabi for Common Courses

COURSE VI: EVOLUTION OF THE PHILOSOPHY OF SCIENCE: LITERARY PERSPECTIVES

COURSE CODE	ENCN6
TITLE OF THE COURSE	EVOLUTION OF THE PHILOSOPHY OF SCIENCE: LITERARY PERSPECTIVES
SEMESTER IN WHICH THE COURSE IS TAUGHT	4
NO. OF CREDITS	4
NO. OF CONTACT HOURS	90

1. Aim of the Course

- The course aims at promoting a new way of thinking which will encompass both science and literature and facilitate communication between both science and literature.

2. Objective of the course

- To inculcate in the students a broad outlook which will enable them to understand that literature with scientific content is the best means of communicating scientific ideas in an interesting manner

3. Course outline

Module 1 – General Perspectives (18 hours)

1. What is Science? – George Orwell
2. The Origin of Science – Will Durant
3. Scientific Outlook – C.V.Raman
4. Our Picture of the Universe – Stephen Hawking
5. Our Ancestors – Carl Sagan

Module 11- Specific Concerns (18 hours)

1. Literature and Science – Aldous Huxley
2. Literature and Ecology – William Rueckert
3. Science and Society – Albert Einstein
4. A Little Bit of What You Fancy – Desmond Morris

Module 111 – Narratives on Science (18 hours)

1. Moxon's Master – Ambrose Bierce
2. The Stolen Bacillus – H.G.Wells
3. EPICAC – Kurt Vonnegut
4. Comets – Jayant Narlikar

Module 1V – Science on Stage (18 hours)

1. The Last War – Neil Grant
2. Unplugged – G. L. Horton

Module V – Poetic Musings on Science (18 hours) (18 hours)

1. Science – Robinson Jeffers
2. Hiroshima Remembered – Satchidanandan
3. Cosmic Gall – John Updike
4. Once I Looked into Your Eyes – Paul Muldoon
5. Your Attention Please – Peter Porter
6. The Microbe – Hillaire Belloc
7. The Magnet and the Churn – William S. Gilbert

4. Core Text

Dr K Sujatha and Dr Sobhana Kurien Ed. *Evolution of the Philosophy of Science: Literary Perspectives*. Ane books and Mahatma Gandhi University.

5. Model Question Paper

(To be incorporated later)

SYLLABI FOR COMMON COURSES

Perspectives in Literature (For Model I B Com Semester III)

COURSE CODE	ENCNC1
TITLE OF THE COURSE	Perspectives in Literature
SEMESTER IN WHICH THE COURSE IS TO BE TAUGHT	3
NO. OF CREDITS	3
NO. OF CONTACT HOURS	54

1. AIM OF THE COURSE

To acquaint the learners with the different forms of literature and develop in them an ability to understand and appreciate literary pieces.

2. OBJECTIVES OF THE COURSE

- To sensitize students to the aesthetic, cultural and social aspects of literature.

- To develop in the learners an appreciation of the subtle nuances of literary expression.
- To enable the learners to revalue literature as cultural and communicative events.
- To improve the learners' use of language as a means of subjective expression.

3. OUTLINE OF THE COURSE

MODULE ONE: ESSAYS (18 hours)

1. E.V. Lucas : **“Bores”**
2. Jawaharlal Nehru : **“A Glory has Departed”**
3. Amartya Sen : **“Tryst with Destiny”**
4. Bertrand Russell : **“How to Escape from Intellectual Rubbish”**

MODULE TWO: POETRY (18 hours)

1. William Shakespeare : Sonnet XXX
2. John Keats : **“Ode to the Nightingale”**
3. Robert Frost : **“Mending Wall”**
4. David Malouf : **“The Bicycle”**
5. Maya Angelou : **“Poor Girl”**
6. Kamala Das : **“The Mask”**
7. Nissim Ezekiel : **“Goodbye party for Miss Pushpa T.S”**
8. Gabriel Okara : **“Once Upon a Time”**

MODULE THREE: SHORT STORIES (18 hours)

1. Anton Chekov : **“The Lottery Ticket”**
2. O. Henry : **“Jimmy Valentine”**
3. R. K. Narayan : **“A Shadow”**

4. Anita Desai : “A Devoted Son”

5. A J Cronin : “Two Gentlemen of Verona”

4. CORE TEXT

Dr Leesa Sadasivan Ed. *Perspectives in Literature*. Foundation Books.

5. Model Question Paper (To be incorporated later)

SYLLABI FOR COMMON COURSES

**Reflections on Vital Issues
(For Model I B Com Semester IV)**

COURSE CODE	ENCNC2
TITLE OF THE COURSE	Reflections on Vital Issues
SEMESTER IN WHICH THE COURSE IS TO BE TAUGHT	4
NO. OF CREDITS	3
NO. OF CONTACT HOURS	54

1. AIM OF THE COURSE

To acquaint the learners with some of the relevant issues of the contemporary world through literature pieces.

2. OBJECTIVES OF THE COURSE

- To sensitize the learners to various global as well as regional problems.
- To motivate the learners towards constructive use of the language through the selected literature pieces.
- To inspire the learners to read further about relevant contemporary issues and thereby to form informed opinions on them.

3. OUTLINE OF THE COURSE

MODULE ONE: Globalization and its consequences (18 hours)

1. Fritjof Capra : “The Dark Side of Growth”
2. Joseph Stiglitz : “Globalization”
3. D H Lawrence : “Money Madness”
4. S Joseph : “For the Dispossessed”
5. Vandana Shiva : “The Social Costs of Economic Globalization”
6. Jagannath Prasad Das : “Kalahandi”

MODULE TWO: Human Rights (18 hours)

1. Nani A Palkivala : “Human Rights and Legal Responsibilities”
2. Martin Luther King : “I Have a Dream”
3. Kalpana Jain : “Stigma, Shame and Silence”
4. Wole Soyinka : “Telephone Conversation”
5. Omprakash Valmiki : “Joothan”

MODULE THREE: Gender Questions (18 hours)

1. Jamaica Kincaid : “Girl”
2. Taslima Nasrin : “At the Back of Progress”
3. Judy Brady : “Why I Want a Wife”
4. J B Priestley : “Mother’s Day”
5. Amartya Sen : “More Than 100 Million Women are Missing

4. CORE TEXT

Dr P J George Ed. *Reflections on Vital Issues*. Orient Blackswan.

The Board of Studies in Botany (U G), Mahatma Gandhi University, Kottayam

5. Model Question Paper (To be incorporated later)

**COMPLEMENTARY COURSE FOR
BOTANY– ZOOLOGY (I TO IV
SEMESTER)**

ZOOLOGY COMPLEMENTARY COURSE FOR BOTANY
**MODEL I AND SIMILAR PROGRAMMES (HOME SCIENCE/
BIOLOGICAL TECHNIQUES AND SPECIMEN PREPARATION)**

Semester I

ZY1C01U Animal Diversity – Non Chordata

2 hrs/week

36/hrs

Credit – 2

Objectives

1. To acquire knowledge on the taxonomic status of various Invertebrate animals and animal groups.
2. To familiarize the students with the diverse group of organisms around us.
3. To develop an aptitude for understanding nature and its rich bio-diversity.

Module 1

General Introduction

1 hr

5 Kingdom classification, Classification in general

Core Readings

Ekambaranatha Ayyer M (1990) A Manual of Zoology, Volume 1.

Invertebrate Part I and Part II S Viswanathan printers 7 Publishers

Pvt.Ltd

Vijayakumaran Nair, Jayakumar J & Paul P I (2007)

Protista & Animal Diversity Academica Publications. Zoological

Society of Kerala.

Animal Diversity (2002). Published by Zoological Society of

Kerala.

Module 2

Kingdom Protista

7

hrs

Salient features and classification up to phyla

1. Phylum Rhizopoda : Amoeba

2. Phylum Actinopoda : Actinophrys
3. Phylum Dinoflagellata : Noctiluca
4. Phylum Parabasalia : Trychonympha
5. Phylum Metamonada : Giardia
6. Phylum Kinetoplasta : Trypanosoma
7. Phylum Euglenophyta : Euglena
8. Phylum Cryptophyta : Cryptomonas
9. Phylum Opalinata : Opalina
10. Phylum Bacillariophyta : Diatoms
11. Phylum Chlorophyta : Volvox
12. Phylum : Proterospongia

Choanoflagellata

13. Phylum Ciliophora : Paramecium
14. Phylum Sporozoa : Plasmodium
15. Phylum Microsporidia : Nosema
16. Phylum Rhodophyta : Red Alga

(Mention any five general characters for each phylum. Detailed accounts of examples are not necessary.)

Pathogenic protista – Plasmodium, Entamoeba.

Core Readings

Ekambaranatha Ayyer M (1990) A Manual of Zoology, Volume 1. Invertebrate Part I and Part II S Viswanathan printers 7 Publishers Pvt.Ltd

Vijayakumaran Nair, Jayakumar J & Paul P I (2007)

Protista & Animal Diversity Academica Publications.

Zoological Society of Kerala. Animal Diversity (2002). Published by Zoological Society of Kerala.

Module 3

Mesozoa – eg. Rhopalura (mention 5 salient features)

2

Parazoa

hrs

Phylum Porifera – eg Leucosolenia
Phylum Placozoa – e g. Trycoplax adherens.

Core Readings

Ekambaranatha Ayyer M (1990) A Manual of Zoology, Volume 1.

The Board of Studies in Botany (U G), Mahatma Gandhi University, Kottayam

Invertebrate Part I and Part II S Viswanathan printers 7 Publishers
Pvt.Ltd

Vijayakumaran Nair, Jayakumar J & Paul P I (2007)

Protista & Animal Diversity Academica Publications.

Zoological Society of Kerala. Animal Diversity (2002). Published
by Zoological Society of Kerala.

Module 4

Phylum : Coelenterata

3hrs

Salient features, Classification up to classes

1. Hydrozoa – Physalia
2. Scyphozoa – Aurelia
3. Anthozoa – Adamsia

Corals and coral reefs.

Core Readings

Ekambaranatha Ayyer M (1990) A Manual of Zoology, Volume 1.
Invertebrate Part I and Part II S Viswanathan printers 7 Publishers
Pvt.Ltd

Vijayakumaran Nair, Jayakumar J & Paul P I (2007)

Protista & Animal Diversity Academica Publications.

Zoological Society of Kerala. Animal Diversity (2002). Published
by Zoological Society of Kerala.

Module 5

Phylum - Platyhelminthes

2

hes

Salient features, classification upto classes

1. Turbellaria – Planaria
2. Trematoda – Fasciola
3. Cestoda – Taenia solium

Core Readings

Ekambaranatha Ayyer M (1990) A Manual of Zoology, Volume 1.
Invertebrate Part I and Part II S Viswanathan printers 7 Publishers
Pvt.Ltd

Vijayakumaran Nair, Jayakumar J & Paul P I (2007)

Protista & Animal Diversity Academica Publications.

Zoological Society of Kerala. Animal Diversity (2002). Published
by Zoological Society of Kerala.

Module 6

Phylum Nematoda

2

hrs

Salient features, classification up to classes

1. Phasmidia - Wuchereria
2. Aphasmidia – Trichinella

Module 7

Phylum - Annelida

2

hrs

Salient features, classification upto classes

1. Polychaeta, - Nereis
2. Oligochaeta – Earthworm – Pheretima
3. Hirudinomorpha – Hirudinaria

Core Readings

Ekambaranatha Ayyer M (1990) A Manual of Zoology, Volume 1.
Invertebrate Part I and Part II S Viswanathan printers 7 Publishers
Pvt.Ltd

Vijayakumaran Nair, Jayakumar J & Paul P I (2007)

Protista & Animal Diversity Academica Publications.

Zoological Society of Kerala. Animal Diversity (2002). Published
by Zoological Society of Kerala.

Module 8

Phylum Arthropoda

10

hrs

Salient features

Type - Prawn - Penaeus

Classification upto classes

Subphylum Chelicerata

Class 1. Merostoma – Limulus

2. Arachnida – Spider

3. Pycnogonida – Nymphon

Subphylum Mandibulata

Class 1. Crustacea – Daphnia

2. Chilopoda - Centepede
3. Symphyla - Scutigera
4. Diplopoda - Millipede
5. Pauropoda - Pauropus
6. Insecta - Butterfly

(Detailed account of examples are not necessary)

Phylum Onychophora – eg. Peripatus (Mention its affinities)

Insect pests

1. Pests of coconut – *Oryctes rhinoceros*, *Rhynchophorus ferrugineus*, *Nephantis serinopa*, *Eriophid mite*
2. Pests of paddy – *Leptocorisa acuta*, *Spodoptera mauritius*
3. Pests of stored grains - *Trogoderma granarium*, *Tribolium castaneum*, *Sitophilus oryzae*

Core Readings

Ekambaranatha Ayyer M (1990) A Manual of Zoology, Volume 1. Invertebrate Part I and Part II S Viswanathan printers 7 Publishers Pvt.Ltd

Vijayakumaran Nair, Jayakumar J & Paul P I (2007)

Protista & Animal Diversity Academica Publications.

Zoological Society of Kerala. Animal Diversity (2002). Published

by Zoological Society of Kerala.

Module: - 9

Phylum – Mollusca

3

hrs

Salient features and classification upto classes

1. Aplousobranchia – Neomenia
2. Monoplacophora – Neopalina
3. Bivalvia – Perna
4. Polyplacophora – Chiton
5. Gastropoda – Xancus
6. Cephalopoda – Sepia

7. Scaphopoda – Dentalium

Core Readings

Ekambaranatha Ayyer M (1990) A Manual of Zoology, Volume 1. Invertebrate Part I and Part II S Viswanathan printers 7 Publishers Pvt.Ltd

Vijayakumaran Nair, Jayakumar J & Paul P I (2007)

Protista & Animal Diversity Academica Publications.

Zoological Society of Kerala. Animal Diversity (2002). Published by Zoological Society of Kerala.

Module 10

Phylum - Echinodermata

3

hrs

Salient features , classification upto classes

Class 1. Asteroidea – Astropecten

2. Ophiuroidea - Ophiothrix

3. Echinoidea – Echinus

4. Holothuroidea – Cucumaria

5. Crinoidea – Antedon

Core Readings

Ekambaranatha Ayyer M (1990) A Manual of Zoology, Volume 1. Invertebrate Part I and Part II S Viswanathan printers 7 Publishers Pvt.Ltd

Vijayakumaran Nair, Jayakumar J & Paul P I (2007)

Protista & Animal Diversity Academica Publications. Zoological Society of Kerala.

Animal Diversity (2002). Published by Zoological Society of Kerala.

Module 11

Phylum Hemichordata

Salient features eg: Balanoglossus

1 hr

Core Readings

Ekambaranatha Ayyer M (1990) A Manual of Zoology, Volume 1. Invertebrate Part I and Part II S Viswanathan printers 7 Publishers

Pvt.Ltd

Vijayakumaran Nair, Jayakumar J & Paul P I (2007)

Protista & Animal Diversity Academica Publications.

Zoological Society of Kerala. Animal Diversity (2002). Published

by Zoological Society of Kerala.

Selected Further Readings

Barnes, R.D. , 1987. Invertebrate Zoology (W.B. Saunders, New York).

Barrington, E.J.W., 1967. Invertebrate Structure and function (ELBS and Nelson ,
London).

Dhami, P.S. and Dhami, J.K. 1979. Invertebrate Zoology (R. Chand and Co. New
Delhi).

Ekamberanatha Ayyar M. (1990) A Manual of Zoology, Volume I. Invertebrate Part
I and Part II S. Viswanathan Printers & Publishers Pvt. Ltd.

Groove, A.J. and Newell, G.E. 1974. Animal Biology – Indian Reprint (University
Book Stall, New Delhi).

Hyman, L.H. The Invertebrate vols. (McGraw-Hill) 1942. Comparative vertebrate
Anatomy (The University of Chicago Press).

James R.D. (1987). Invertebrate Zoology, W.B. Saunders, New York.

Kapoor V.C. (1994). Theory and Practice of Animal Taxonomy.

Kapoor, V.C. 1994. Theory and Practice of Animal Taxonomy (Oxford and IBH
Publishing Co., New Delhi.)

Kotpal R.L. Agarwal S.K. and R.P. Khetharpal (2002). Modern Text Book of
Zoology.

Parker T.J and Haswell W.A. (1962). Text Book of Zoology Vol. I. Invertebrate
(ELBS & Macmillan, London).

Marshall, A.J. and Williams, W.D. 1972. Text Book of Zoology Vol. Invertebrates
(ELBS and Macmillan, London).

Mayer, E. 1980. Principles of Systematic Zoology (Tata McGraw Hill Publishing
Co., New Delhi.)

Nair, K.K. Ananthakrishnan, T.N. David, B.V. 1976. General and Applied
Entomology (T.M.H. New Delhi).

Curriculum for B. Sc Botany Programme

Practicals

ZY1C01U [P] ANIMAL DIVERSITY – NON CHORDATA

2 hr/week,
36 hrs
Credit – 1

1. Scientific drawing - 5 specimens
2. Simple identification – 25 invertebrates (Out of which 15 by their scientific names)
3. T.S - Earthworm, T.S Fasciola
4. Dissection - Prawn Nervous system
5. Dissection - Cockroach Nervous system
6. Mounting – Prawn Appendages
7. Mounting – Cockroach Mouth parts

SEMESTER II

ZOOLOGY COMPLEMENTARY COURSE FOR BOTANY MODEL I AND SIMILAR PROGRAMMES (HOME SCIENCE/ BIOLOGICAL TECHNIQUES AND SPECIMEN PREPARATION)

ZY2C02U - ANIMAL DIVERSITY – CHORDATA

36 hrs
Credits 2

Objectives

1. To acquire knowledge on the taxonomic status of the various vertebrate animals and animal groups.
2. To familiarise the students with the diverse groups of organisms around us.
3. To develop an aptitude for understanding nature and its rich biodiversity.

Module I

7hrs

Phylum Chordata

General characters of the Phylum Chordata

Classification upto classes

Sub phylum I Urochordata

General characters

Class 1 Larvacea eg. Oikopleura

2. Ascidiacea eg. Ascidia

3. Thaliacea eg. Salpa

Subphylum II Cephalochordata

General characters eg. Brachiostoma

Subphylum III Vertebrata

General characters

Division I Agnatha

General characters

Class 1 Cyclostomata eg. Petromyzon

Class 2 Ostracodermi eg. Cephalapis

Division 2 Gnathostomata

General characters

Super class Pisces and Super class Tetrapoda

Core Readings

Animal Diversity (2002). Zoological Society Of Kerala Study Material Series. Published by Zoological Society of Kerala
Ekamberanatha Ayyar M. (1990) A Manual of Zoology, Volume I. Vertebrate Part I and Part II S. Viswanathan Printers & Publishers Pvt. Ltd.
Young J.Z. 1981. The life of Vertebrates (Oxford University Press).

Module II

**3
hrs**

Super class Pisces

General characters

Class 1. Chondrichthyes eg. Narcine

Class 2. Osteichthyes eg. Latimeria

Accessory respiratory organs in fishes.

Core Readings

Animal Diversity (2002). Zoological Society Of Kerala Study Material Series. Published by Zoological Society of Kerala
Ekamberanatha Ayyar M. (1990) A Manual of Zoology, Volume I. Vertebrate Part I and Part II S. Viswanathan Printers & Publishers Pvt. Ltd.

Young J.Z. 1981. The life of Vertebrates (Oxford University Press).

Module III

**16
hrs**

Super Class Tetrapoda

General characters

Class : Amphibia General characters

Type : *Rana hexadactyla*

Order I. Urodela eg. Amblystoma

II. Anura eg. Bufo

III . Apoda eg. Ichthyophis

Core Readings

Animal Diversity (2002). Zoological Society Of Kerala Study Material Series. Published by Zoological Society of Kerala
Ekamberanatha Ayyar M. (1990) A Manual of Zoology, Volume I. Vertebrate Part I and Part II S. Viswanathan Printers & Publishers Pvt. Ltd.

Young J.Z. 1981. The life of Vertebrates (Oxford University Press).

Module IV Class Reptilia

4

hrs

General characters

Sub class I: Anapsida Eg. Chelone

Sub class II Diapsida Eg. Chameleon

Subclass III Parapsida eg. Ichthyosaurus

Poisonous and non-poisonous snakes of India

Core Readings

Animal Diversity (2002). Zoological Society Of Kerala Study

Material Series. Published by Zoological Society of Kerala

Ekamberanatha Ayyar M. (1990) A Manual of Zoology, Volume I.

Vertebrate Part I and Part II S. Viswanathan Printers &

Publishers Pvt. Ltd.

Young J.Z. 1981. The life of Vertebrates (Oxford University Press).

Module V Class Aves

3

General characters

hrs

Sub class I : Archeornithes Eg: Archaeopteryx

Sub class II. Neornithes Eg: Struthio

Flight adaptations of birds

Core Readings

Animal Diversity (2002). Zoological Society Of Kerala Study

Material Series. Published by Zoological Society of Kerala

Ekamberanatha Ayyar M. (1990) A Manual of Zoology, Volume I.

Vertebrate Part I and Part II S. Viswanathan Printers &

Publishers Pvt. Ltd.

Young J.Z. 1981. The life of Vertebrates (Oxford University Press).

Module VI Class – Mammalia

3

hrs

General characters

Sub class I Prototheria eg. Echidna

Sub Class II Metatheria eg. Macropus

Sub class III Eutheria eg. Elephas

Aquatic mammals

Core Readings

Animal Diversity (2002). Zoological Society Of Kerala Study

The Board of Studies in Botany (U G), Mahatma Gandhi University, Kottayam

Material Series. Published by Zoological Society of Kerala

Ekamberanatha Ayyar M. (1990) A Manual of Zoology, Volume I.

Vertebrate Part I and Part II S. Viswanathan Printers &

Publishers Pvt. Ltd.

Young J.Z. 1981. The life of Vertebrates (Oxford University Press).

Selected Further Readings

Deoras, P.J. 1981. Snakes of India (National Book Trust of India.)

Ekamberanatha Ayyar M. (1990) A Manual of Zoology, Volume I. Vertebrate Part I

and Part II S. Viswanathan Printers & Publishers Pvt. Ltd.

Groove, A.J. and Newell, G.E. 1974. Animal Biology - Indian Reprint Universal

Book Stall, New Delhi.

Induchoodan, 1986, Kweralathile Pakshikal (Kerala Sahitya Academy, Trichur).

Kapoor, V.C. 1994, Theory and Practice of Animal Taxonomy (Oxford and IBM

Publishing Co. New Delhi.

Lagler, K.F. , Bardach, J.E. , Miller, R.R. Passino, D.R.M. 1977 Ichthyology (John

Wiley and Sons).

Mayer, E. 1980. Principles of Systematic Zoology (Tata McGraw Hill Publishing

Co. New Delhi.

Newman, H.H. 1939. Phylum Chordata, (Macmillan Pub. Co. New York)

Nigam H.C. 1978 , Zoology of Chordata (S. Chand and Co. New Delhi).

Parker, T.J. and Haswell W.A. 1962. Text Book of Zoology Vol. II Vertebrates

(ELBS and Macmillan , London).

Parter S.H. 1971. The Book of Indian Animals (Bombay Natural History Society).

Salim Ali, 1969. Birds of Kerala (Oxford University Press).

Sinha A.K. , Adhikari S. Ganguly, B.B. 1988. Biology of Animals Vol. II (New

Central Book Agency, Calcutta.)

Whitaker, R. 1978 Common Indian Snakes – A field Guide Macmillan and Co. of

India Ltd.)

Young J.Z. 1981. The life of Vertebrates (Oxford University Press).

Young J.Z. Life of mammals) Oxford University Press).

Curriculum for B. Sc Botany Programme

Practicals

ZY2C02U [P] - ANIMAL DIVERSITY – CHORDATA

**2 hrs/week
36 hrs
Credit I**

1. Morphology
Scientific drawing – 5 specimens of chordates
2. Simple identification of 10 chordates (Out of which 5 by their scientific names)
3. Osteology – Vertebrae and girdles of Frog
4. Snake identification - 3 poisonous and
3 non poisonous with key
5. Mounting of placoid scales of shark
6. Dissections:
Frog: Photographs/Diagrams/one dissected & preserved specimen each/
models may be used for the study.
 1. Frog – Viscera
 2. Frog – Digestive System
 3. Frog – Arterial System
 4. Frog – Sciatic plexus
 5. Frog – Brain

SEMESTER III

ZOOLOGY COMPLEMENTARY COURSE FOR BOTANY (MODEL I) AND SIMILAR PROGRAMMES (HOME SCIENCE/ BIOLOGICAL TECHNIQUES AND SPECIMEN PREPARATION)

ZY3C03U - HUMAN PHYSIOLOGY AND IMMUNOLOGY

3 hrs/week

54 hrs

Credits 3

Objectives

- To inspire the students in learning the frontier areas of biological sciences
- To appreciate the correlation between structure and function of organisms
- To make them aware of the health related problems, their origin and treatment.

Part I HUMAN PHYSIOLOGY

36

Module 1 : Nutrition

hrs

3

Malnutrition disorders, Vitamin deficiencies, and mineral deficiencies
(Iron, Calcium and Iodine)

hrs

Core Readings

Guyton 2002: Text Book of Medical Physiology Saunders pp.718-833

Prosser & Brown 2006 : Comparative Animal Physiology

Zoological Society of Kerala, Study material 2002. *Biochemistry,
Physiology and Developmental Biology* Published by Zoological
Society of Kerala

Module 2: Respiration

5

hrs

Transport of O₂ and CO₂ in blood, respiratory disorders – Dyspnoea,
Hypoxia, Asphyxia, Hypo and Hypercapnia, CO poisoning, smoking

and its physiological effects.

Core Readings

Guyton 2002: Text Book of Medical Physiology Saunders pp432-509
Zoological Society of Kerala, Study material 2002. *Biochemistry, Physiology and Developmental Biology* Published by Zoological Society of Kerala

Module 3: Circulation

7

hrs

Blood – Composition and function, Brief account of mechanism of blood clotting; Disorders of blood clotting – Haemophilia, cerebral and pulmonary thrombosis, Cerebral haemorrhage, Blood pressure and factors controlling it; electrocardiogram, Cardiovascular disorders – Arteriosclerosis, Myocardial infraction, Angiogram and Angioplasty.

Core Readings

Guyton 2002: Text Book of Medical Physiology Saunders pp.144-262, 382-429, 711-715.
Zoological Society of Kerala, Study material 2002. *Biochemistry, Physiology and Developmental Biology* Published by Zoological Society of Kerala

Module 4 Excretion

6

hrs

Structure of human nephron, composition of urine – normal and abnormal constituents, urine formation (ultra filtration , selective reabsorption, tubular secretion and counter current mechanism); Hormonal control of renal function, Kidney disorders – myeleonephritis, glomerular nephritis, nephrotic syndrome, Dialysis

Core Readings

Guyton 2002: Text Book of Medical Physiology Saunders pp.264-379
Zoological Society of Kerala, Study material 2002. *Biochemistry, Physiology and Developmental Biology* Published by Zoological Society of Kerala

Module 5 Neurophysiology

**6
hrs**

Structure of typical neuron, myelinated and non myelinated nerve fibres; Nerve impulse – initiation and propagation of nerve impulse, All or none law, Saltatory conduction, Synaptic transmission, Neurotransmitters, Brian waves, Electroencephalogram, Neural disorders – Parkinson’s disease, Epilepsy, Alzheimer’s syndrome, Dyslexia.

Core Readings

Guyton 2002: Text Book of Medical Physiology Saunders pp.512-715
Zoological Society of Kerala, Study material 2002. *Biochemistry, Physiology and Developmental Biology* Published by Zoological Society of Kerala

Module 6 Muscle Physiology

**4
hrs**

Striated, Non striated and Cardiac muscle, Ultra structure of striated muscle fibre, Mechanism of muscle contraction, Threshold and spike potential, Fatigue, O₂ dept, Rigor mortis.

Core Readings

Guyton 2002: Text Book of Medical Physiology Saunders pp.52-86
Zoological Society of Kerala, Study material 2002. *Biochemistry, Physiology and Developmental Biology* Published by Zoological Society of Kerala

Module 7 Endocrinology

**5
hrs**

Endocrine glands and their hormones, mode of action (in brief) , Hypothalamus, Pituitary , Thyroid, Parathyroid, Thymus , Islets of Langerhands, Adrenal, Testis and ovary , Hormonal disorders.

Core Readings

Guyton 2002: Text Book of Medical Physiology Saunders pp.836-966

Zoological Society of Kerala, Study material 2002. *Biochemistry, Physiology and Developmental Biology* Published by Zoological Society of Kerala

Part II IMMUNOLOGY

18

Module 8

**hrs
3**

Introduction to immunology

Types of immunity, innate immunity , acquired, passive , active

Mechanism of innate immunity (eg. Barriers , phagocytosis , inflammation) Complement System, biological effects of complements.

hrs

Core Readings

Panicker, S. Francis G., and Abraham G.K. 2008 , Microbiology and Immunology, Study Material Series published by Zoological Society of Kerala Chapter 1

Ivan Roitt, 2002 *Essentials of Immunology ELBS*

Module 9

5

Antigens and antibodies

Types of antigens , haptens, antigenic determinants.

Basic structure of immunoglobulins , Different classes of immunoglobulins and functions.

hrs

Core Readings

Panicker, S. Francis G., and Abraham G.K. 2008 , Microbiology and Immunology, Study Material Series published by Zoological Society of Kerala Chapter 4

Ivan Roitt, 2002 *Essentials of Immunology ELBS*

Module 10

5

Antigen antibody reactions

Precipitation test, agglutination test ,

Clinical applications of antigen antibody reaction, Widal, VDRL, HIV

hrs

test (ELISA), Complement Fixation Test, and Coombs test.

Core Readings

Panicker, S. Francis G., and Abraham G.K. 2008 , Microbiology and Immunology, Study Material Series published by Zoological Society of Kerala

Ivan Roitt, 2002 *Essentials of Immunology ELBS*

Module 11

5

hrs

(Brief accounts of the followings)

Immune response system

Primary and secondary lymphoid organs,

Cells of Immune system – Leucocytes, lymphocytes, T&B cells,

Macrophages, Plasma cells , Memory cells, MHC, Antibody

synthesis, Monoclonal antibodies, Hybridoma technology

Immune disorders – hypersensitivity, Auto immunity &

Immunodeficiency, AIDS,

Vaccines - Major types of vaccines (BCG, DPT, Polio vaccine and

TAB vaccines). Recent trends in vaccine preparation.

Core Readings

Panicker, S. Francis G., and Abraham G.K. 2008 , Microbiology and Immunology, Study Material Series published by Zoological Society of Kerala Chapter 10.

Ivan Roitt, 2002 *Essentials of Immunology ELBS*

Sobha & Sharma (2008) *Essentials of Modern Biology One's Student edition* PP 463-468.

Selected Further Readings

Anthanarayan R & C.K. Jayaram Panicker. Textbook of Microbiology (2008)
Orient Longman Private Ltd.

Colemen: Fundamentals of Immunology

Guyton, Medical Physiology

Ivan Roitt: *Essentials of Immunology ELBS*.

Madhavankutty, Medical Physiology

Mahupathra, Human Physiology, Current Books

Michael J. Pelczar ECS, Chan & Noel. R. Kreig, Microbiology, Tata McGraw
Hill 5th ed. 1996.

Michael J. Gibuay, Ian A. Macdonald and Helen M. Roche, Nutrition and
Metabolism.

Monica Cheesbrough: Laboratory Manual for Tropical Countries. Vol.II
Microbiology, ELBS – Cambridge Ed. 1986.

Paniker S., Francis G. and Abraham G.K 2008, Microbiology and Immunology,
Study Material Series published by Zoological Society of Kerala.

Park, K. Park's Text Book of Preventive and Social Medicine – 2002, 17^t Ed.
Banarasidass Bhenot Publications

Prosser and Brown, Comparative Animal Physiology

Sebastian Prof. M.M., Animal Physiology

William S Hoar, Animal Physiology.

ZY3C03U[P] - HUMAN PHYSIOLOGY AND IMMUNOLOGY

2Hrs/Week

36Hrs

Credit 1

- 1 Preparation of Human Blood smear & identification of leucocytes
- 2 Qualitative analysis of Reducing Sugar, Protein and Lipid
- 3 Action of Salivary amylase on Starch (Demonstration Only)
- 4 Estimation of Haemoglobin (Demonstration only)
- 5 Identification of human blood groups, A, AB, B and O, Rh factor
- 6 Instruments (Principle & use)– Sphygmomanometer , Stethoscope ,

Measurement of blood pressure using Sphygmomanometer

(demonstration)

SEMESTER IV

**ZOOLOGY COMPLEMENTARY COURSE FOR BOTANY (MODEL
I) AND SIMILAR PROGRAMMES (HOME SCIENCE/ BIOLOGICAL
TECHNIQUES AND SPECIMEN PREPARATION)**

ZY4C04U - APPLIED ZOOLOGY

3hrs/week

54 hrs

Credits 3

OBJECTIVES

Equip the students interested in the applied branches of zoology with skills and knowledge which can lead to self employment opportunities.

Module 1: Aquaculture

24

hrs

Traditional methods of aquaculture, Advantages and salient features of aquaculture, Types of aquaculture, Biotic and abiotic factors of water, Importance of Alga in aquaculture, Common Cultivable fishes of Kerala Economic importance and morphology of culturable species *Catla, Rohu, Mrigal, Cyprinus carpio, Etroplus, & Tilapia* .
Penaes indicus, P.monodon, Perna viridis/Perna indicus, Pinctada fucata.

Pond culture (Construction and maintenance) Brief Description of Carp culture Composite fish culture. Integrated Fish Culture, Induced breeding in fishes, Important Fish Diseases. Fish preservation and processing

Aquarium management, Setting up of an Aquarium, Biological filter and Aeration . Common species of Aquarium fishes.

Prawn culture, Mussel culture , Pearl culture

Core Readings:

Applied Zoology; (2002) Published by Zoological Society Of Kerala

Module 2 Sericulture

12

hrs

Four species of silkworms, Life history of silkworms, Silkworm

Rearing Techniques. Diseases and Pests of silkworms. Mounting of worms. Harvesting and stiffling of cocoons. Silkworm diseases.

Preventive and control measures.

Core Readings:

Applied Zoology; (2002) Published by Zoological Society Of Kerala
Sudheeran, M.S. & John P.C., 1989 Economic Zoology (Prathibha Publ.,
Kottayam)

Module 3 Vermiculture

**6
hrs**

Species of Earthworms suitable for vermiculture. Reproduction and Life Cycle . Physical and Chemical effects of Vermiculture, Vermicomposting, Site Selection, Cement pit Soil pit . Preparation of pit. Maintenance and Monitoring

Core Readings:

Applied Zoology; (2002) Published by Zoological Society Of Kerala
Venkitaraman, P.R., 1983, Text Book of Economic Zoology (Sudarsana
Publ. Cochin)

Module 4 Apiculture

**12
hrs**

Species of Honey bees. Organization of honeybee colony. Bee keeping methods and equipments Apiary management and maintenance. Bee pasturage, Byproducts of honey bees and their uses. Diseases and pests of honey bees, control measures.

Core Readings:

Applied Zoology; (2002) Published by Zoological Society Of Kerala
Shukla G.S., & Updhyay V.B., Economic Zoology (Rastogi Publ. Meerut)
Selected Further Readings

Alikunhi, K.h., Fish Cluture in India (ICAR, New Delhi)

Bhosh, C.C., 1949, Silk Production and Weaving in India (CSIR), New Delhi)

Director. Zoological Survey of India, 1994, earthworms Resources and Vermiculture

- Edwards, C.A. & Lafty, J.R. 1972 Biology of Earthworms (Chapman and Hall Led. London)
- Jhingran, V.G., 1985 Fish and Fisheries of India (Hindustan Publ. Corporation, New Delhi)
- Kurien, C.V. & Sebastian V.C., Prawn Fisheries in India (Hindustan Publ. Corporation, New Delhi)
- Krishnaswami, S., 1986 Improved Method of Rearing Young age Silk worms (Central Silk board Bangalore)
- Krishnaswami, S., 1986, New Technology of Silkworm Rearing (Central Silk Board Bangalore)
- Lee, K. E., 1985 Earthworms, Their Ecology and relationships with Soils and Land use. Academics Press.
- Menon, K.N., 1970 Malsyakrishi (State Institute of language, Trivandrum)
- Mysore Silk Association, 1986, Silkworm rearing and Diseases of Silkworms
- Padmanabha Aiyer, K.S., 1992, Records of the Indian Museum Vol. XXXI, Part I, PP. 13-76 An Account of the Oligochacta of the Travancore
- Shiggene, K., 1969, Problems in Prawn Culture (American publ. Co., New Delhi)
- Shukla G.S., & Updhyay V.B., Economic Zoology (Rastogi Publ. Meerut) Andhra Pradesh Agricultural University, Hyderabad)
- Sinhan, V.R.P. & Ramachandran, V., 1985, Fresh water Fish Culture (ICAR, New Delhi)
- Singh, S., 1962 Bee keeping in India (ICAR, New Delhi)
- Singh, V.P.P. and Ramachandran, V., 1985 Freshwater Fish Culture (ICAR, New Delhi)
- Sudheeran, M.S. & John P.C., 1989 Economic Zoology (Prathibha Publ., Kottayam)
- Ullal, S. R. and Narasimahanna, M.N., Handbook of Practical Sericulture (Central Silk Board Bombay.)
- Venkitaraman, P.R., 1983, Text Book of Economic Zoology (Sudarsana Publ. Cochin)

Practicals

ZY4C04U [P] - APPLIED ZOOLOGY

2 hrs/week

1 credit

36 hrs

1. General Identification, Economic importance, Morphology, scientific names and common names of the following
 - a. Economic importance and morphology of culturable species (Catla, Rohu, Mrigal, Grass carp, Common carp, , Etroplus Tilapia)
Penaeus indicus,/P.monodon,
Perna viridis/P.indicus
Pinctada fucata
 - b. 2 species of earthworms used in Vermiculture
 - c. Two species of honey bees
 - d. Silkworm. Cocoon/Adult
2. Castes of bees
3. Bee keeping equipments Beehive, Smoker, honey extractor
4. Beeswax, Honey, Silk, Vermicompost (Identification-Uses)
5. Chandrika /Natrika used in sericulture
- 6. Fish diseases (any 2 diagrams/specimens)**
- 7. Fish Parasite (any one)**