
ST. TERESA'S COLLEGE, ERNAKULAM

(AUTONOMOUS)

Affiliated to Mahatma Gandhi University, Kottayam



CURRICULUM FOR

BACHELOR'S PROGRAMME

IN ZOOLOGY

Under Choice Based Credit & Semester System
& Outcome Based Education
(2018 Admissions)

BZOO - B.Sc. ZOOLOGY
PROGRAM SPECIFIC OUTCOMES

PSO1: Explain the major concepts and theoretical principles in the undergraduate programme in Zoology.

PSO2: Apply different domains of knowledge to deal with problems in Zoology

PSO3: Integrate critical thinking and scientific knowledge to design, perform, record and analyse experiments.

PSO4: Develop communication skills to decipher and transmit the basic concepts and emerging trends in Zoology.

PSO5: Apply the theoretical knowledge and skills in biology and Chemistry and environmental consciousness to identify, investigate and formulate new ideas and concepts.

SEMESTER I

Course Code	Course Title	Credits	Course Type
EN1A01B18	Fine-Tune Your English	4	Common Course I
EN1A02B18	Pearls From The Deep	3	Common Course I
FR1A01B18	French Language And Communicative Skills -I	4	Common Course II
HN1A01B18	Kahaani Aur Upanyas	4	
MA1A01B18	Kathasahithyam	4	
ZY1B01B18	General Perspectives In Science & Protistan Diversity	2	Core Course
CH1C01B18	Basic Theoretical And Analytical Chemistry	2	Complementary Course I
BO1C01B18	Cryptogams, Gymnosperms And Plant Pathology	2	Complementary Course II

SEMESTER I

COMMON COURSE I

EN1A01B18– FINE-TUNE YOUR ENGLISH

Credits: 4

Total Lecture Hours: 90

Course Outcomes:

CO1: Recognize the basics of English grammar

CO2: Choose the appropriate word classes

CO3: Identify common errors in the use of English language in various contexts

CO4: Apply the rules of grammar to comprehend, speak, and write grammatically correct English

CO5: Compose materials for business communication

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	1	3	1
CO2	1	1	1	3	1
CO3	1	1	1	3	1
CO4	1	1	1	3	1
CO5	1	1	1	3	1

Syllabus Content:

Module I

(18 Hours)

The Sentence and its Structure

How to Write Effective Sentences – Phrases: What are They? – The Noun Clauses – The Adverb Clause – “If All the Trees Were Bread and Cheese” – The Relative Clause – How Clauses are Conjoined

Module II (18 Hours)

Word-Classes and Related Topics

Understanding the Verb – Understanding Auxiliary Verbs – Understanding Adverbs –
Understanding Pronouns – The Reflexive Pronoun – The Articles I – The Articles II – The
Adjective – Phrasal Verbs – Mind your Prepositions

Module III (18 Hours)

To Err is Human

Concord – Errors – Common and Uncommon

Spelling and Pronunciation

Pronunciation: Some Tips – More Tips on Pronunciation – An awesome Mess? – Spelling Part II

Module IV (18 Hours)

Tense and Related Topics

‘Presentness’ and Present Tenses – The ‘Presentness’ of a Past Action – Futurity in English –
Passivisation

Interrogatives and Negatives

Negatives – How to Frame Questions – What’s What? – The Question Tag

Module V (18 Hours)

Conversational English

Some time expressions – Is John There Please?

Miscellaneous and General Topics

Reading

Letter Writing

In addition there will be an essay question on a genre

SEMESTER I

COMMON COURSE I

EN1A02B18 - PEARLS FROM THE DEEP

Credits: 3

Total Lecture Hours: 72

Course Outcomes:

CO1: Name prominent literary figures and recognize various literary devices

CO2: Analyze inherent themes and motives

CO3: Identify the nuances of the age in which the literary work was written

CO4: Examine the different aspects of theatre

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	1	3	1
CO2	1	1	1	3	1
CO3	1	1	1	3	1
CO4	1	1	1	3	1

Syllabus Content

Module I (Fiction)

(18hours)

Ernest Hemingway: The Old Man and the Sea

Module II (One Act Plays)

(18hours)

Susan Glaspell: Trifles

Asif Currimbhoy: The Refugee

A.A Milne: The Boy Comes Home

Module III (Short Stories)

(18hours)

Guy De Maupassant: Two Friends

O. Henry: The Gift of Magi

K.A Abbas: Sparrows

Flora Annie Steel: Valiant Vicky, the Brave Weaver

Module IV (Poems)

(18hours)

Rumi: The Chance of Humming

Walter Scott: Lochinvar

John Keats: La Belle Dame Sans Mercy

Robert Frost: After Apple Picking

Chinua Achebe: Refugee Mother and Child

Kamala Das: My Grandmother's House

Ted Hughes: Jaguar

Pablo Neruda: Tonight I can Write the Saddest Lines

P.P Ramachandran: How Simple It Is!

SEMESTER I

COMMON COURSE II

FR1A01B18 – FRENCH LANGUAGE AND COMMUNICATIVE SKILLS -I

Credits: 4

Total Lecture Hours: 72

Course Outcomes:

CO1: Describe topics such as family, professions, time, place, likes and dislikes, daily life situations.

CO2: Develop language, vocabulary and grammar skills.

CO3: Articulate various speech sounds and their determined combinations.

CO4: Prepare conversations based on scenarios which helps while traveling

CO5: Articulate the concepts to express one's opinion in a specific situation.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	1	3	1
CO2	1	1	1	3	1
CO3	1	1	1	3	1
CO4	1	1	1	3	1
CO5	1	1	1	3	1

Syllabus Content:

Module I

(25 hours)

La population L'alphabet – Les chiffres – Identité – Se présenter – Poser des questions – Les professions – Les nationalités

Module II

(23 hours)

La banlieue Demander une information, un prix – l'heure – la ville

Module III

(24 hours)

Quartier de Paris Décrire un lieu – Indiquer un prix, un itinéraire.

SEMESTER I
COMMON COURSE II
HN1A01B18 - KAHAANI AUR UPANYAS

Credits: 4

Total Lecture Hours: 72

Course Outcomes:

CO1: Discuss story content and structure in depth.

CO2: Analyse characterisation and comment on the development of the characters as the story/novel unfolds.

CO3: Analyse short stories and novels on the basis of literary elements like plot, theme, metaphor, and image.

CO4: Compare treatments of theme, character and subject matter of different short stories.

CO5: Illustrate greater reading fluency and improved vocabulary in Hindi.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	1	3	1
CO2	1	1	1	3	1
CO3	1	1	1	3	1
CO4	1	1	1	3	1
CO5	1	1	1	3	1

Syllabus Content:

Module I

(16Hrs)

Syllabus- Anthim Saakshya –Chandrakaanta Chapters 1 ,2

Eidgaah- Premchand

Module II

(20 hrs)

Syllabus-Anthim Saakshya –Chandrakaanta Chapters 3, 4, 5 Jangal Ka Daah- Swayam Prakash

ChchuttiKa Din- UshaPriyamvada

Module- III

(20hrs)

Syllabus- Anthim Saakshya –Chandrakaanta Chapters 6,7,8MaaRasoi Mei Rehti Hai – Kumar

Ambuj Kheer – Madhavi Kutty

Module IV

(16 Hrs)

Syllabus- Anthim Saakshya –Chandrakaanta Chapters 9, 10 Heelibon Ki Baththakhe- Agyey

SEMESTER I

COMMON COURSE II

MA1A01B18 - KATHASAHITHYAM

Credits: 4

Total Lecture Hours: 72

Course Outcomes:

CO1: ചെറുകഥ, നോവൽ പഠനത്തിലൂടെ വായനാശേഷിയും ആസ്വാദനപ്രാപ്തിയും കൈവരിക്കൽ.

CO2: ചെറുകഥയുടെയും നോവലിന്റെയും കാലാനുസൃതമായ ഭാവുകത്വ പരിണാമം തിരിച്ചറിയൽ.

CO3: നിലവിലുള്ള സാമൂഹ്യജീവിത യാഥാർത്ഥ്യങ്ങളെ അഭിമുഖീകരിക്കാൻ പ്രാപ്തരാക്കൽ.

CO4: ആശയവിനിമയം, ഭാഷാവിഷ്കരണം എന്നീ ശേഷികൾ കൈവരിക്കുന്നു

CO5: കഥ, നോവൽ എന്നിവയുടെ വ്യതിരിക്ത സവിശേഷതകൾ തിരിച്ചറിയുന്നു.

CO6: പുതുകാലജീവിതാനുഭവങ്ങൾ വിലയിരുത്താൻ പര്യാപ്തരാകുന്നു

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	1	3	1
CO2	1	1	1	3	1
CO3	1	1	1	3	1
CO4	1	1	1	3	1
CO5	1	1	1	3	1
CO6	1	1	1	3	1

ഖണ്ഡം ഒന്ന്

10 മണിക്കൂർ

1.പുവമ്പഴം -കാരുർ

2.ഭൂമിയുടെ അവകാശികൾ -വൈക്കം മുഹമ്മദ്ബഷീർ

ഖണ്ഡം രണ്ട്

15മണിക്കൂർ

1.കടൽ -ടി .പദ്മനാഭൻ

2.പെരുമഴയുടെ പിറ്റേന്ന് -എം. ടി. വാസുദേവൻ നായർ

3.മാനാഞ്ചിറടെസ്സ് -വി .കെ.എൻ

4.തരിശു നിലം -മാധവിക്കുട്ടി

ഖണ്ഡം മൂന്ന്

15മണിക്കൂർ

1.ആർക്കറിയാം -സക്കറിയ

2.ഓരോഏഴുത്തുകാരിയുടെഉള്ളിലും -സാനാജോസഫ്

3.തിരുത്ത് -എൻ .എസ് .മാധവൻ

4.മോഹമത്തെ -കെ .ആർ .മീര

ഖണ്ഡം നാല്

10 മണിക്കൂർ

1.അഗ്നി -സിതാര.എസ്

2.ബിരിയാണി -സന്തോഷ് എച്ചിക്കാനം

3.മോദസ്ഥിരനായി അങ്ങസിപ്പുമല പോലെ -എസ്. ഹരീഷ്

4.സ്നേഹബഹുമാനപ്പെട്ട അന്നാമ്മയ്ക്ക്ഗീതാലക്ഷ്മി എഴുതുന്ന കത്ത് -പ്രിയ എ .എസ്

5.ചിലസ്വപ്നങ്ങളിൽസീതാലക്ഷ്മിയുടെ കറുത്ത മുടിയിഴ -ഇന്ദുമേനോൻ

ഖണ്ഡം അഞ്ച്

22മണിക്കൂർ

ആടുജീവിതം -ബന്യാമിൻ

SEMESTER I

COMPLEMENTARY COURSE I

CH1C01B18 BASIC THEORETICAL AND ANALYTICAL CHEMISTRY

Credits: 2

Total Lecture Hours: 36

Course Outcomes:

CO1: Describe the Bohr atom model, types of bonds, Valence bond and VSEPR theories and Hybridization.

CO2: Explain the periodic properties of elements and concepts of chemical equilibrium.

CO3: Identify methods for separating a given organic compound from a reaction mixture and quantification of inorganic metal ions using titrimetric and gravimetric analysis

CO4: Differentiate between column chromatography, PC, TLC, GC, IEC and HPLC techniques

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	1	1	3
CO2	1	1	2	1	3
CO3	1	1	2	1	3
CO4	1	1	2	1	3

Syllabus

Module 1 : Atomic Structure and Chemical Bonding

(12 Hrs)

Atomic Structure: Bohr atom model and its limitations, Dual nature of matter and radiation. Photoelectric effect, de Broglie equation, Heisenberg's uncertainty principle, Concept of orbital, Quantum numbers, shapes of orbitals (*s*, *p*, *d*), Electronic configuration of atoms - Aufbau principle, Hund's rule of maximum multiplicity, Pauli's exclusion principle.

Chemical Bonding: Introduction – Type of bonds. Ionic bond: Factors favouring the formation of ionic bonds. Covalent bond: Valence bond theory – Coordinate bond. VSEPR theory and examples. Hybridisation: - sp^3 , sp^2 and sp (ethane, ethene, ethyne). Intermolecular forces - Hydrogen bonding in H_2O - Dipole-dipole interactions.

Module II : Fundamental Concepts in Chemistry

(9 hrs)

Periodic Properties: Modern periodic law – Long form of periodic table. Periodicity in properties: Atomic radii, ionic radii, ionization enthalpy, electron affinity (electron gain enthalpy) and electronegativity (Pauling scale). Atomic mass - Molecular mass - Mole concept – Molar volume - Oxidation and reduction – Oxidation number and valency - Equivalent mass.

Concept of Equilibrium: Acids and Bases - Arrhenius, Lowry-Bronsted and Lewis theories. Ionic product of water - pH and pOH, Strengths of acids and bases - K_a and K_b , pK_a and pK_b . Buffer solution. Solubility, solubility product, common ion effect and their applications.

Module III : Basic Principles of Analytical Chemistry

(9 Hrs)

Methods of Analysis: Volumetric method of analysis - General principles. Primary and secondary standards, criteria for primary standards, preparation of standard solutions, standardization of solutions, end point. Acid base, redox and complexometric titrations and corresponding indicators. Double burette method of titration: Principle and advantages. Microanalysis and its advantages. Gravimetric method of analysis: General principles.

Reporting of Analytical Data: Precision and accuracy – Types of errors – Ways of expressing precision – Methods to reduce systematic errors.

Separation and Purification Techniques: Recrystallisation, use of drying agents, sublimation.

General principles of distillation, fractional distillation, distillation under reduced pressure.

Solvent extraction.

Module 1V: Chromatographic Techniques

(6 Hrs)

Chromatography - Principle of differential migration. Classification of chromatographic methods. Basic principle and uses of Thin layer chromatography (TLC), Paper chromatography (PC), R_f value, Column chromatography, Gas chromatography (GC), High performance Liquid chromatography (HPLC), Ion Exchange chromatography (IEC).

SEMESTER I

COMPLEMENTARY COURSE II

BO1C01B18 - CRYPTOGRAMS, GYMNOSPERMS AND PLANT PATHOLOGY

Credits: 2

Total Lecture Hours: 36

Course Outcomes:

CO1: Identify the different cryptogam specimens by a detailed study of their characteristics and life cycles.

CO2: Explain the morphological, anatomical and reproductive features of bryophytes, pteridophytes and gymnosperms and their life cycles

CO3: Describe the evolutionary advancement and diversity of the plant world.

CO4: Identify major plant diseases based on symptoms, their causative organisms and the control measures adopted.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	2	1	3
CO2	1	1	2	1	3
CO3	1	1	2	1	3
CO4	1	1	2	1	3

Syllabus Content:

CRYPTOGAMS

(27 hours)

Module I: Algae (13 hrs)

Algae: General characters of algae and their classification up to classes (F E Fritsch); range of thallus variation in Algae. Reproduction and life history of the following groups with reference to the types mentioned: Cyanophyceae - Nostoc; Chlorophyceae - (Volvox, Spirogyra, Cladophora - vegetative features only), Oedogonium; Phaeophyceae – Sargassum; Rhodophyceae – Polysiphonia. Economic importance of Algae: food, industry, medicine, biofertilizers; algal bloom.

Module II: Fungi and Lichens

(9 hours)

Fungi: General characters and outline on the classification of fungi by Ainsworth. General characters, thallus structure, reproduction and life history of the following groups with reference to the types mentioned: Zygomycotina – Rhizopus; Ascomycetes – Xylaria; Basidiomycetes – Puccinia. Economic importance of Fungi: as food, industry, decomposition of organic matter. Fungal toxins and human health. Lichens: Classification based on thallus morphology. Usnea - morphology and anatomy of vegetative and reproductive structure. Economic importance of lichen: food, industry, medicine.

Module III: Bryophytes

(5 hours)

Bryophytes: General characters of Bryophytes. Morphology, anatomy, reproduction and life cycle of Riccia. Pteridophytes: General characters of Pteridophytes. Morphology, anatomy (stem), reproduction and life cycle of Selaginella.

Module IV: Gymnosperms

(4 hours)

Gymnosperms: General characters of Gymnosperms. Morphology, anatomy (stem, root, coralloid root, rachis and leaf let), reproduction and life cycle of Cycas.

PLANT PATHOLOGY (5 hrs)

Module V: Plant Diseases

(5hours)

Plant diseases: Classification of plant diseases on the basis of causative organism and symptoms. Study the following diseases with special emphasis on causative organism, symptoms and control measures: (i) Nut fall of Arecanut (ii) Bacterial blight of Paddy (iii) Leaf mosaic of Tapioca.

PRACTICAL

(36 hours)

1. Micropreparation and identification preparation of the following: (i) Algae: Vegetative structure of Nostoc, Volvox, Spirogyra, Oedogonium, Cladophora, Polysiphonia. Vegetative and reproductive structure of Sargassum. (ii) Fungi: Vegetative and reproductive structure of Rhizopus, Xylaria, Puccinia. (iii) Lichen: Morphology of Usneathallus and apothecium. (iv) Bryophytes: Ricciathallus morphology and anatomy. (v) Pteridophytes: Selaginella – morphology (vegetative and reproductive) and anatomy (stem). (vi) Gymnosperms: Cycas – morphology (vegetative and reproductive) and anatomy of corolloid root, rachis and leaflet. 2. Identify plant diseases mentioned in the syllabus.

SEMESTER I

CORE COURSE

ZY1B01B18 - GENERAL PERSPECTIVES IN SCIENCE & PROTISTAN DIVERSITY

Credits: 2

Total Lecture Hours: 36

Course outcome

CO1: Explain perspectives in science

CO2: Differentiate the systematic principles for classification of animals

CO3: Identify Protistan Diversity

CO4: Distinguish Parasitic protists

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	1	1	1
CO2	3	1	2	1	1
CO3	3	1	2	1	1
CO4	3	1	2	1	2

Syllabus Content

PART I PERSPECTIVES IN SCIENCE 8Hrs

Module I Introduction to Scientific Studies 4 Hrs

Types of knowledge: practical, theoretical, and scientific knowledge. What is science, Features of science, Deductive and inductive models, scientific temper, empiricism, vocabulary of science.

Module II What is Biology? 4 Hrs

Life and its manifestations, History of Biology: Biology in ancient times Landmarks in the progress of Biology. Branches of Zoology, Scope of Zoology

PART II SYSTEMATICS 10 Hrs

Module III Taxonomical Principles and tools

Systematic, Taxonomy, Phylogeny [Brief account], Approaches to taxonomy, Molecular taxonomy, Bar coding, Tree of Life, Zoological nomenclature, International Code of Zoological Nomenclature (ICZN), Law of Priority. Five Kingdom Classification; Linnaean classification, Basis for Animal kingdom classification [Levels of organization, Symmetry, Coelom],

Identification tools: Taxonomic key. Types: Single access key- Dichotomous [linked and nested] and Polytomous key, Multi access key, Computer aided Interactive Key, Advantages and Disadvantages.

PART III PROTISTAN DIVERSITY

18 Hrs

Module IV Kingdom Protista

Type: Paramecium

5 Hrs

Salient features of Kingdom Protista

10 Hrs

Classification of Protista up to phyla

1. Phylum Rhizopoda : Eg. Amoeba
2. Phylum Actinopoda : Eg. Actinophrys
3. Phylum Dinoflagellata : Eg. Noctiluca
4. Phylum Parabasalia : Eg. Trichonympha
5. Phylum Metamonada : Eg. Giardia
6. Phylum Kinetoplasta : Eg. Trypanosoma
7. Phylum Euglenophyta : Eg. Euglena
8. Phylum Cryptophyta : Eg. Cryptomonas
9. Phylum Opalinata : Eg. Opalina
10. Phylum Bacillariophyta : Eg. Diatoms
11. Phylum Chlorophyta : Eg. Volvox
12. Phylum Choanoflagellata : Eg. Proterospongia
13. Phylum Ciliophora : Eg. Balantidium coli
14. Phylum Sporozoa : Eg. Plasmodium
15. Phylum Microsporidia : Eg. Nosema
16. Phylum Rhodophyta : Eg. Red Alga

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

General Topics:

3 Hrs

1. Parasitic protists (diseases mode of transmission and prophylactic measures) - Entamoeba, Trypanosoma, Plasmodium (detailed account of life cycle), Leishmania.

SEMESTER II

Course Code	Course Title	Credits	Course Type
EN2A03B18	English 3 - Issues that Matter	4	Common Course I
EN2A04B18	English 4 - Savouring the Classics	3	Common Course I
FR2A03B18	French - French Language and communicative skills-II	4	Common Course II
MA2A03B18	Malayalam – Kavitha	4	
HN2A03B18	Hindi - Kavita Vyakaran Aur Anuvad	4	
CH2C01B18	Basic Organic Chemistry	2	Complementary Course I
CH2CP01B18	Volumetric Analysis	2	Complementary Course Practical
BO2C01B18	Plant Physiology	2	Complementary Course II
BO2CP01B18	Cryptogams, Gymnosperms, Plant Pathology and Plant Physiology	2	Complementary Course Practical
ZY2B02B18	Animal Diversity- Non Chordata	2	Core Course 2
ZY2BP01B18	General Perspectives in Science, Protistan Diversity& Animal Diversity –Non Chordata	2	Core Course Practical

SEMESTER II
COMMON COURSE I
EN2A03B18– ISSUES THAT MATTER

Credits: 4

Total Lecture Hours: 90

Course Outcomes:

CO1. Identify the major issues of contemporary significance

CO2. Discuss the consequences of war and refugee crisis with respect to the psychological dimension

CO3. Employ theoretical learning in classrooms to current developments in the world

CO4. Critique the diverse experiences both historical and contemporary to create a more informed vision of the future

CO5. Develop oneself as a conscious, concerned, conscientious human being

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	1	3	1
CO2	1	1	1	3	1
CO3	1	1	1	3	1
CO4	1	1	1	3	1
CO5	1	1	1	3	1

Syllabus Content:

Module 1

(18 hours)

“The Unsundered People” – Kenzaburo Oe

“The Old Prison” – Judith Wright

“War” – Luigi Pirandello

Module 2 (18 hours)

Persuasions on the Power of the Word:

“On Censorship” – Salman Rushdie

“Peril” – Toni Morrison

“The Burning of the Books” – Bertolt Brecht

“The Censors” – Luisa Valenzuela

Module 3 (18 hours)

“The Poisoned Bread” – Bandhu Madhav

“A Trip Westward” – Zitkala-Sa

“The Pot Maker” – Temsula Ao

Module 4 (18 hours)

“Does it Matter?” – Richard Leakey

“On Killing a Tree” – Gieve Patel

“Hagar: A Story of a Woman and Water” (Gift in Green (chapter 2)) – Sarah Joseph

Module 5 (18 hours)

“Understanding Refugeeism: An Introduction to Tibetan Refugees in India” – Mallica Mishra

“Refugee Blues” – W.H Auden

“The Child Goes to the Camp” (from Palestine's Children) – Ghassan Kanafani

SEMESTER II

COMMON COURSE I

EN2A04B18 - SAVOURING THE CLASSICS

Credits: 3

Total Lecture Hours: 72

Course Outcomes:

CO1: Recognise the time-tested literary masterpieces from diverse cultures

CO2: Identify the representative authors from various genres (poetry, drama, novel, short fiction)

CO3: Recite celebrated lines from Classic works

CO4: Discuss the 'universals' of human condition

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	1	3	1
CO2	1	1	1	3	1
CO3	1	1	1	3	1
CO4	1	1	1	3	1

Syllabus Content

Module 1 (Poems)

(18hours)

Homer: "Father and Son" (Odyssey Book 16: 113-189) (Translated by Robert Fagles)

Kalidasa: "Lovely is Youth" (Translated by J.G Jennings)

Omar Khayyam: Rubaiyat (quatrains: 25-28) (Translated by Edward Fitzgerald)

Dante: Dante meets Virgil (Inferno Canto 1: 49-102) (Translated by J.G Nichols)

John Milton: "On his Blindness"

Module 2 (Shakespeare Excerpts)

(18hours)

Romeo and Juliet: Act II, Scene ii

The Merchant of Venice: Act IV, Scene i

Module 3 (Novel Excerpts)

(18hours)

Miguel de Cervantes: Don Quixote (Chapter 8) (Translated by Edith Grossman)

Jane Austen: Pride and Prejudice (Chapters 1-6)

Victor Hugo: Les Miserables (Part 1- Fantine, Book II, Chapters 9-13) (Translated by Christine Donougher)

Module 4 (Short Fiction)

(18hours)

Charles Dickens: The Black Veil

Leo Tolstoy: How Much Land Does a Man Need? (Translated by Louise & Aulmer Maude)

Rabindranath Tagore: Kabuliwala (Translated by Mohammad A Quayum)

Jorge Louis Borges: The Shape of the Sword (Translated by Andrew Hurley)

SEMESTER II
COMMON COURSE II

FR2A03B18 – FRENCH LANGUAGE AND COMMUNICATIVE SKILLS-II

Credits: 4

Total Lecture Hours: 72

Course Outcomes:

CO1: Identify familiar everyday expressions and basic phrases.

CO2: Ask questions to get meaningful responses in effective communication

CO3: Develop language, vocabulary and grammar skills.

CO4: Prepare conversations based on various situations

CO5: Articulate the concepts to express one's opinion in a specific situation.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	1	3	1
CO2	1	1	1	3	1
CO3	1	1	1	3	1
CO4	1	1	1	3	1
CO5	1	1	1	3	1

Syllabus Content

Module I (25 hours)

Chambre pour étudiants Localiser des objets – l'habitat – les meubles – l'appréciation

Module II (23 hours)

Petits boulots Téléphoner – Raconter – l'emploi

Module III (24 hours)

Le resto U Exprimer une opinion – Poser des questions – la nourriture

SEMESTER II

COMMON COURSE II

HN2AO3B18 - KAVITA , VYAKARAN AUR ANUVAD

Credits : 4

Total Lecture Hours: 72

Course Outcomes:

CO1:Contextualize and Summarise the poems of different genres in Hindi.

CO2:Evaluate the Poets contribution to Hindi literature.

CO3:Demonstrate linguistic ability for translation of texts between Hindi & English

CO4:Classify Parts of Speech.

CO5:Illustrate greater fluency in Hindi by applying theoretical knowledge of Grammar

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	1	3	1
CO2	1	1	1	3	1
CO3	1	1	1	3	1
CO4	1	1	1	3	1
CO5	1	1	1	3	1

Syllabus Contents

Module I (18 Hours)

Vyaakaran

Module II (20 Hours)

Tulasidas

Kabir

Ve Muskathe Phool Nahi- Mahadevi Verma

Cheenane Aaye Hain Ve – Sarweshvar Dayal Saxena

Dilli Darwaaza – Kumar Vimal

Jungle Ke Ujaad Mei – Vinod Kumar Shukla

Aazadi Urf Gulaami – Gyanendrapathi

Module III

(20 Hours)

Meera

Bazaar- Mangalesh Dabraal

Beesvi Sadi Ke Antim Dino Ka Aashcharya- Rajesh Joshi

Do Haathiyon Ki Ladaai- Uda Pakash

Thande Paani Ki Machine – Ekant Srivastav

Saboot – Arun Kamal

Tumhe Kuch Karna Chahiye – Chanrakanth Devthale

Module IV

(14 Hours)

Anuvaad

SEMESTER II
COMMON COURSE II

MA2A03B18-കവിത

ക്രെഡിറ്റ് : 4

പഠനസമയം : 72 മണിക്കൂർ

കോഴ്സ് ഔട്ട്കോം (Course Outcome)

CO1.പത്തൊൻപത് കവിതകളുടെ പഠനത്തിലൂടെ വായനാശേഷിയും ആസ്വാദന പ്രാപ്തിയും കൈവരിക്കൽ.

CO2.മലയാളകവിതകളിലെ കാലാനുസൃതമായ ഭാവുകത്വപരിണാമം തിരിച്ചറിയൽ.

CO3.നിലവിലുള്ള സാമൂഹ്യജീവിതയാഥാർത്ഥ്യങ്ങളെ അഭിമുഖീകരിക്കാൻ പ്രാപ്തരാക്കൽ.

CO4.പരിസ്ഥിതിസൗന്ദര്യശാസ്ത്രത്തെയും ചില സാമൂഹ്യചരിത്ര പശ്ചാത്തലങ്ങളെയും കുറിച്ച് ഗ്രഹിക്കൽ.

CO5.വിദ്യാർത്ഥികളുടെ സർഗ്ഗാത്മകശേഷി വികസിക്കൽ

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	1	3	1
CO2	1	1	1	3	1
CO3	1	1	1	3	1
CO4	1	1	1	3	1
CO5	1	1	1	3	1

ഖണ്ഡം ഒന്ന്-

20 മണിക്കൂർ

1. മാംസനിബദ്ധമല്ല രാഗം -കുമാരനാശാൻ (ലീലയിലെ 47 മുതൽ 74 വരെയുള്ള 28 ശ്ലോകങ്ങൾ)

2.സ്നേഹസുന്ദരപാതയിലൂടെ -വൈലോപ്പിള്ളി ('കുടിയൊഴിക്കലി'ലെ അവസാന ഖണ്ഡം)

ഖണ്ഡം രണ്ട്

15 മണിക്കൂർ

1.ഒറ്റയ്ക്കിരിക്കാൻ പഠിച്ചുകഴിഞ്ഞു ഞാൻ -സുഗതകുമാരി

2.കോഴി -കടമ്മനിട്ടരാമകൃഷ്ണപിള്ള

3.പഴഞ്ചൊല്ലുകൾ -സച്ചിദാനന്ദൻ

4.മുള്ളൻപനി -കെ.ജി.ശങ്കരപ്പിള്ള

ഖണ്ഡം മൂന്ന്

15 മണിക്കൂർ

1.തിരുത്ത്-പി .പി.രാമചന്ദ്രൻ

2.പിറക്കാത്ത മകൻ -ബാലചന്ദ്രൻ ചുള്ളിക്കാട്

3.മൃഗശിക്ഷകൻ -വിജയലക്ഷ്മി

4.കുന്നിമണികൾ-കുഞ്ഞുണ്ണി

ഖണ്ഡം നാല്

22 മണിക്കൂർ

1.ആടിയാടില അലഞ്ഞ മരങ്ങളേ -അൻവർ അലി

2.കൽവീട് -വി.എം.ഗിരിജ

3. ആഴങ്ങൾ അടച്ചിട്ട പുഴ -എസ് .ജോസഫ്

4.സ്മാരകം -വീരാൻകുട്ടി

5.കുട്ടമ്മാൻ -എം.ർ.രേണുകുമാർ

6.നാഷണൽ ജ്യോഗ്രഫി -എസ് .കണ്ണൻ

7.വാഴക്കുല -കെ .ആർ.ടോണി

8.പഴയ ചിലത് -പി.രാമൻ

9.ഗോതമ്പുശിലും -കവിത ബാലകൃഷ്ണൻ

SEMESTER II

COMPLEMENTARY COURSE I

CH2C01B18 BASIC ORGANIC CHEMISTRY

Credits: 2

Total Lecture Hours: 36

Course Outcomes:

CO1: Apply the IUPAC nomenclature to name and write the structure of organic compounds including stereoisomers.

CO2: Explain the types of reagents, reactive intermediates, reaction mechanisms and the corresponding influencing factors in organic chemistry.

CO3: Explain stereoisomerism in organic chemistry.

CO4: Explain the classification, structure, properties, methods of preparation, uses and environmental toxicity of polymers.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	1	1	3
CO2	1	1	1	1	3
CO3	1	1	1	1	3
CO4	1	1	1	1	3

Syllabus Content

Module 1: Fundamental Concepts of Organic Chemistry

(9 hrs)

Introduction: Origin of organic chemistry – Uniqueness of carbon – Homologous series. IUPAC nomenclature of alkyl halides, alcohols, aldehydes, ketones, carboxylic acids and amines. Structural isomerism: Chain isomerism, position isomerism, functional isomerism, metamerism and tautomerism. Bond fission - homolytic and heterolytic fission. Types of reagents - Electrophiles and nucleophiles. Polarity of bonds. Reaction Intermediates: Carbocations,

carbanions and free radicals (Structure and stability). Types of organic reactions: Addition, Elimination, Substitution and Rearrangement (definition and one example each).

Module II: Mechanisms of Organic Reactions

(9 hrs)

Meaning of reaction mechanism. Polarity of bonds. Electron Displacement Effects: Inductive effect - Definition - Examples - +I and -I groups. Applications: Explanation of substituent effect on the acidity of aliphatic carboxylic acids. Mesomeric effect: Definition – Characteristics - +M and -M groups, Applications. Hyperconjugation: Definition – Characteristics. Applications: Baker-Nathan effect, Comparison of stability of 2-methyl-1-butene & 2-methyl-2-butene. Steric effect (causes and simple examples).

Substitution reactions: nucleophilic substitution of alkyl halides- S_N1 and S_N2 mechanisms. Electrophilic substitutions in benzene.

Addition reactions: Electrophilic addition to alkene - Markwonikoff's rule, Peroxide effect.

Elimination reactions: E1 and E2 mechanisms. (General mechanism is only needed)

Module III: Stereochemistry of Organic Compounds

(9 hrs)

Stereoisomerism – definition, classification.

Geometrical Isomerism: Definition – Condition – Geometrical isomerism in but-2-ene and but-2-ene-1,4-dioic acid. cis and trans, *E* and *Z* configurations. Methods of distinguishing and interconversion of geometrical isomers.

Conformations: Newman projection, Saw-horse projection. Conformations of ethane.

Optical Isomerism: Optical activity – Chirality – Enantiomers - Meso compounds - Diastereoisomers – Optical isomerism in lactic acid and tartaric acid - Racemisation and resolution (elementary idea only).

Module IV: Natural and Synthetic Polymers

(9 hrs)

Introduction. Classification of polymers: Natural, synthetic; linear, cross-linked and network; plastics, elastomers, fibres; homopolymers and copolymers. Polymerization reactions. Typical examples: Polyethylene, polypropylene, PVC, phenol-formaldehyde and melamine-formaldehyde resins, polyamides (nylons) and polyesters. Natural rubber: structure, latex processing methods, vulcanization and uses. Synthetic rubbers: SBR, nitrile rubber and neoprene. Biodegradability of polymers, environmental hazards.

SEMESTER I and II
COMPLEMENTARY COURSE I (PRACTICAL)
CH2CP01B18: VOLUMETRIC ANALYSIS

Credits – 2

Total Hours: 72

Course Outcomes:

CO1: Prepare standard solutions for microscale volumetric analysis.

CO2: Record the molarity of the given intermediate solution by standardizing it.

CO3: Calculate the mass of the analyte in a given solution by microscale volumetric analysis.

CO4: Administer microscale analysis of solutions by different types of volumetry like acidimetry, alkalimetry, permanganometry, dichrometry, iodometry and iodimetry.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	3	1	2
CO2	1	1	3	1	2
CO3	1	1	3	1	2
CO4	1	1	3	1	2

Syllabus Content

Standard solution must be prepared by the student.

1. Acidimetry and Alkalimetry

1. Standardization of HCl with standard Na₂CO₃ solution
2. Standardization of NaOH with standard oxalic acid solution

-
3. Estimation of any acid using standard NaOH
 4. Estimation of any alkali using standard HCl.

2. Permanganometry

1. Standardization of KMnO_4 using (i) oxalic acid (ii) Mohr's salt
2. Estimation of Fe^{2+} in Mohr's salt and crystalline Ferrous Sulphate using standard KMnO_4 .

3. Dichrometry

1. Estimation of Ferrous ions (external indicator)
2. Estimation of Ferrous ions (internal indicator)
3. Estimation of $\text{FeSO}_4 \cdot 7 \text{H}_2\text{O}$ (external indicator)

4. Iodimetry and Iodometry

1. Standardization of Iodine solution
2. Standardization of Sodium thiosulphate
3. Estimation of KMnO_4
4. Estimation of Copper

SEMESTER II
COMPLEMENTARY COURSE II
BO2C01B18 - PLANT PHYSIOLOGY

Credits: 2

Total Lecture Hours: 36

Course Outcomes:

CO1: Discuss the mechanism of water and mineral absorption in plants.

CO2: Interpret the mechanisms of photosynthesis

CO3: Explain the translocation of photosynthate

CO4: Analyze the processes of growth and development in plants

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	1	1	3
CO2	1	1	1	1	3
CO3	1	1	1	1	3
CO4	1	1	1	1	3

Syllabus Content:

Module 1: Water Relations

(10 hrs)

Plant water relations: Physical aspects of water absorption - Diffusion, DP, DPD. Imbibition. Osmosis OP, Exosmosis, Endosmosis, Plasmolysis. Water potential and its components. Mechanism of water absorption by root - active and passive absorption. Movement of water towards xylem by apoplast and symplast pathway. Ascent of sap – theories - transpiration pull theory, root pressure theory; guttation.

Transpiration: types, mechanism of transpiration and stomatal movement K^+ - ABA theory), significance and factors affecting transpiration, antitranspirants.

Module 2: Mineral Nutrition

(5 hrs)

General account on micro and macro nutrients. Absorbable form, function and deficiency symptoms of the following mineral nutrients: N, P, K, Mg, B, Fe, Zn.

Module 3: Photosynthesis

(10 hrs)

Basic requirements of Photosynthesis: Light - PAR; organs and site of photosynthesis; chloroplast. Photosynthetic pigments, photosynthetic unit; red drop and Emerson's enhancement effect; two pigment systems.

Mechanism of photosynthesis: light dependent reaction - cyclic and non cyclic photo phosphorylation. Light independent reaction (dark reactions) C3 cycle, brief account on C4 and CAM Cycles. Factors affecting photosynthesis. Photorespiration (brief study only).

Module 4: Translocation of Photosynthate

(3 hrs)

Translocation of photosynthate and organic solutes: path of translocation, mechanism of translocation (Pressure Flow Hypothesis).

Module 5: Growth and Development

(8 hrs)

Seed dormancy - causes of seed dormancy - methods of breaking dormancy. Germination of seeds - physiological changes. Growth: Phases of growth, plant growth regulators - auxins, gibberellins, cytokinins, abscissic acid and ethylene and their physiological role (brief study only). Photoperiodism definition, short day plants, long day plants, day neutral plants. Vernalization.

COMPLEMENTARY COURSE II (PRACTICAL)

SEMESTER I

BO2CP01B18 - CRYPTOGRAMS, GYMNASPERMS AND PLANT PATHOLOGY

Credits – 1

Total Hours: 36

Course Outcomes:

CO1. Determine the distinctive features of plant groups and categorise them to correct groups in the plant kingdom using morphological, anatomical and reproductive features.

CO2. Distinguish common plant diseases that affect crops based on symptoms and recommend the preventive and remedial measures

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	3	1	2
CO2	1	1	3	1	2

Syllabus Content

1. Micropreparation and identification preparation of the following:
 - (i) Algae: Vegetative structure of *Nostoc*, *Volvox*, *Spirogyra*, *Oedogonium*, *Cladophora*, *Polysiphonia*. Vegetative and reproductive structure of *Sargassum*.
 - (ii) Fungi: Vegetative and reproductive structure of *Rhizopus*, *Xylaria*, *Puccinia*.
 - (iii) Lichen: Morphology of *Usnea* thallus and apothecium.
 - (iv) Bryophytes: *Riccia* thallus morphology and anatomy.
 - (v) Pteridophytes: *Selaginella* – morphology (vegetative and reproductive) and anatomy (stem).
 - (vi) Gymnosperms: *Cycas* – morphology (vegetative and reproductive) and anatomy of coralloid root, rachis and leaflet.
2. Identify plant diseases mentioned in the syllabus

SEMESTER II
BO2CP01B18- PLANT PHYSIOLOGY

Credit- 1

Total Hours: 36 hrs

Course Outcomes:

CO3. Analyze the physiological requirements and responses in plants during water absorption and photosynthesis through defined experiments.

CO4. Determine plant growth responses using specific experimental apparatus

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO3	1	1	3	1	2
CO4	1	1	3	1	2

Syllabus Content

Core Experiments:

1. Demonstration of osmosis using Potato tuber Osmoscope/Papaya petiole Osmoscope.
2. Separation of leaf pigments by paper chromatography.
3. Compare the stomatal indices of mesophytes and xerophytes.
4. Evolution of oxygen during photosynthesis.

Demonstration experiments:

1. Measure the rate of transpiration by Ganong's potometer.
2. Relationship between transpiration and absorption.
3. Measurement of growth using Arc Auxanometer.
4. Demonstration of geotropic curvature using Clinostat.
5. Mohl's half leaf experiment.
6. Ganong's Light screen experiment.

SEMESTER II

CORE COURSE

ZY2B02B18: ANIMAL DIVERSITY - NON CHORDATA

Credits :2

Total Lecture Hours: 36

Course Outcomes

CO1: Explain the classification of the lower groups of animal kingdom

CO2: Differentiate the characteristics and identify the non-chordates phyla.

CO3: Distinguish the economically important invertebrates

CO4: Identify the larval forms of non-chordates.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	2	1	1
CO2	3	1	2	1	1
CO3	3	1	2	1	1
CO4	3	1	2	1	1

Syllabus Contents

Module I: Kingdom Animalia

10 Hrs

Outline classification of Kingdom Animalia

Three branches - Mesozoa, parazoa and Eumetazoa

Mesozoa: Phylum Orthonectida - Eg. Rhopalura (mention 5 salient features)

Parazoa: 1. Phylum Placozoa – Eg. Trycoplax adherens

2. Phylum Porifera – Classification upto classes; Mention gemmules

Class I: Calcarea. Eg. Sycon

Class II: Hexactinellida Eg. Euplectella

Class III: Demospongia Eg. Cliona.

General Topics

- Canal system in sponges.

Phylum Coelenterata – Type: Obelia Classification upto classes

Class I: Hydrozoa Eg. Halistemma, Physalia. mention Metagenesis

Class II: Scyphozoa Eg. Rhizostoma.

Class III: Anthozoa Eg. Metridium.

General Topics:

- Coral and coral reefs with special reference to conservation of reef fauna.
- Polymorphism in Coelenterates

Phylum Ctenophora - Eg. Pleurobrachia.

Module II

Phylum Platyhelminthes Salient features; classification up to classes **3 Hrs**

Class I: Turbellaria. Eg. Planaria.

Class II: Trematoda Eg. Fasciola

Class III: Cestoda Eg. Taenia saginata.

General Topics:

- Life history of Fasciola hepatica.
- Platyhelminth parasites of Man and Dog (Schistosoma, Taenia solium, Echinococcus)

Phylum Nemathelminthes (Nematoda) **2 Hrs**

Salient features, classification up to classes

Class: Phasmodia Eg. Enterobius

Class: Aphasmodia Eg. Trichinella

General Topic

- Pathogenic nematodes in man. (Wuchereria bancrofti, Ascaris lumbricoides, Ancylostoma duodenale, Trichinella).

Phylum Annelida

2 Hrs

Salient features, Classification upto classes.

Class I: Archiannelida	Eg. Polygordius
Class II: Polychaeta	Eg. Chaetopterus
Class III: Oligochaeta	Eg. Megasclex.
Class IV: Hirudinea	Eg. Ozobranchus, Hirudinaria

Module III

11 Hrs

Phylum Onychophora Eg. Peripatus (Mention its affinities)

Phylum Arthropoda

Salient features, Classification upto classes

Type: Prawn –Fenneropenaeus (Penaeus)

1. Sub Phylum - Trilobitomorpha

Class -Trilobita (mention the salient features) Eg. Triarthrus – A trilobite (extinct)

2. Subphylum –Chelicerata

Class 1 Merostomata (Xiphosura)	Eg. Limulus
Class 2. Arachnida	Eg. Palamnaeus- Scorpion
Class 3 Pycnogonida	Eg. Pycnogonum – Sea spider

3. Subphylum- Crustacea

Class 1 Branchiopoda	Eg. Daphnia
Class 2 Ostracoda	Eg. Cypris -seed shrimp
Class 3 Copepoda	Eg. Cyclops
Class 4 Remipedia	Eg. Speleonectes (eyeless crustacean seen in caves)
Class 5. Branchiura	Eg. Argulus (common fish louse)
Class 6 Cirripedia	Eg. Sacculina (parasitic castrator of crabs)
Class 7 Malacostraca	Eg. Squilla (spot tail mantis shrimp)

4. Subphylum- Uniramia

Class 1 Chilopoda	Eg. Scolopendra – (Centipede)
Class 2 Symphyla	Eg. Scutigera – (garden centipedes or pseudocentipedes)

Class 3 Diplopoda	Eg. Spirostreptus- (Millipede)
Class 4 Pauropoda	Eg. Pauropus
Class 5 Hexapoda	Eg. Bombyx mori – (silk moth) (Insecta)

Module IV

Phylum Mollusca

3 Hrs

Salient features, Classification upto classes

Class I- Aplacophora	Eg. Neomenia
Class II- Monoplacophora	Eg. Neopilina
Class III Amphineura	Eg. Chiton
Class IV Gastropoda	Eg. Aplysia
Class V Scaphopoda	Eg. Dentalium
Class VI Pelecypoda (Bivalvia)	Eg. Pinctada
Class VII Cephalopoda	Eg. Sepia

Phylum Echinodermata

3 Hrs

Classification upto classes

Class I- Asteroidea	Eg. Astropecten
Class II- Ophiuroidea	Eg. Ophiothrix
Class III- Echinoidea	Eg. Echinus
Class IV- Holothuroidea	Eg. Holothuria
Class V – Crinoidea	Eg. Antedon

General Topics

- Larval forms of Echinodermata.

Phylum Hemichordata:

Eg. Balanoglossus

2 Hrs

Minor Phyla

1. Chaetognatha	Eg. Sagitta
2. Sipunculida	Eg. Sipunculus

SEMESTER II
CORE COURSE- PRACTICAL

**ZY2BP01B18: GENERAL PERSPECTIVES IN SCIENCE, PROTISTAN DIVERSITY &
ANIMAL DIVERSITY – NON CHORDATA**

Credits: 2

Total Hours: 72

Course Outcomes

CO1: Dissect the prawn and cockroach nervous system and distinguish the body parts of non-chordates

CO2: Differentiate the characteristics and identify the non-chordate phyla.

CO3: Distinguish and classify the various protists and non chordates

CO4: Illustrate the non chordates

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	1	3	1	1
CO2	2	1	3	1	2
CO3	2	1	3	1	2
CO4	2	1	3	1	1

SEMESTER I
CORE COURSE – PRACTICAL

GENERAL PERSPECTIVES IN SCIENCE AND PROTISTAN DIVERSITY

1. Taxa, identification techniques
Bird body parts
Butterfly/ dragonfly body parts
2. Identification using keys
Insects (Any 3 specimens)
3. General identification - The students are expected to identify any 6 Protistans studied by their generic names and write the general characters of their Phylum.

-
4. Identification of any 4 economically important protists/parasitic protists (Slides/ figures may be used for identification)
 5. Identification of two Protistans from pond water.

SEMESTER II
CORE COURSE –PRACTICAL
ANIMAL DIVERSITY – NON CHORDATA

Scientific Drawing:-

Make scientific drawings of 5 locally available invertebrate specimens belonging to different phyla.

Anatomy:-Study of sections (Any two)

1. Hydra
2. Ascaris (male and female)
3. Earthworm
4. Fasciola

Dissections:

1. Prawn - Nervous system
2. Cockroach - Nervous system

Mounting:-

1. Prawn appendages.
2. Mouth parts - Cockroach/ Plant bug/ House fly / Mosquito. (Any Three)

Identification:-

General identification & classification - The students are expected to identify, classify and describe the following Phylum -wise number of animals by their common names, generic names and 30% of these by their scientific names. Porifera-1, Coelenterata-3, Platyhelminthes-2, Annelida-2, Arthropoda-5, Mollusca- 4, Echinodermata-3.

Identification of (a) Parasitic protist – any 2 (b) larval forms of Fasciola- any 2(c) Nematode parasites of man- any 3 (Slides/figures may be used for study)

Taxonomic identification with key:-

Identification of insects up to the level of Order (any Four).

SEMESTER III

Course Code	Course Title	Credits	Course Type
EN3A05B18	Literature and/as Identity	4	Common Course I
FR3A05B18	An Advanced course in French -I	4	Common Course II
HN3A05B18	Naatak Aur Lambi Kavita	4	
MA3A05B18	Drisyakalasaahithyam	4	
CH3C01B18	Inorganic and Organic Chemistry	3	Complementary Course I
BO3C01B18	Angiosperm Taxonomy and Economic Botany	3	Complementary Course II
ZY3B03B18	Animal Diversity - Chordata	3	Core Course III

SEMESTER III

COMMON COURSE I

EN3A05B18 – LITERATURE AND/AS IDENTITY

Credits: 4

Total Lecture Hours: 90

Course Outcomes:

CO1. Explain how literature problematizes identity.

CO2. Analyze the quest for identity in the Indian diaspora.

CO3. Illustrate the effects of partition and communal violence in South Asian Literature.

CO4. Critique the social construction of identity.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	1	3	1
CO2	1	1	1	3	1
CO3	1	1	1	3	1
CO4	1	1	1	3	1

Syllabus Content

Module 1 (Diasporic Identities)

(18 hours)

Agha Shahid Ali: Postcard from Kashmir

Amy Tan: Mother Tongue

Imtiaz Dharker: At the Lahore Karhai

Chitra Banerjee Divakaruni: Indian Movie, New Jersey

Module 2 (South Asian Identities)

(18 hours)

Sadat Hassan Manto: The Dog of Tetwal

Intizar Hussain: A Chronicle of Peacocks

Selina Hossain: Fugitive Colours

Punakante Wijenaik: That Deep Silence

Module 3 (Life Writings)

(18 hours)

Malcolm X: —Nightmare, excerpt from *The Autobiography of Malcolm X*.

Sashi Deshpande: Learning to be a Mother in *Janani– Mothers, Daughters, Motherhood*, (Ed.) Rinki Bhattacharya.

Module 4 (Indigenous Identities)

(18 hours)

Leslie Marmon Silko: Lullaby

Garhwali Songs in Painted Words- An Anthology of Tribal Literature – Edited by G.N. Devy

Mamang Dai: Pinyar the Widow (Excerpt from *Legends of Pensam*)

Module 5 (Alter Identities)

(18 hours)

Nathaniel Hawthorne: The Birth Mark

Girish Karnad: Hayavadana (Excerpt)

Ruskin Bond: The Girl on the Train

SEMESTER III

COMMON COURSE II

FR3A05B18- AN ADVANCED COURSE IN FRENCH - I

Credits: 4

Total Lecture Hours: 90

Course Outcomes:

CO1: Describe topics such as physical appearance of a person, sports and entertainments.

CO2: Articulate the concepts to express ones opinion in a specific situation.

CO3: Compose conversations based on scenarios which help while shopping.

CO4: Articulate the concepts to give advice and instructions and to invite a person in a specific situation.

CO5: Construct conversations based on scenarios which help during medical and health consultations.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	1	3	1
CO2	1	1	1	3	1
CO3	1	1	1	3	1
CO4	1	1	1	3	1
CO5	1	1	1	3	1

Syllabus Content:

Module I (30 hours)

Jeunes artistes: Décrire une personne - Exprimer une opinion - La description physique - Les spectacles

Module II (30 hours)

Tenue de soirée : Inviter - Les vêtements - Les chaussures - Les couleurs - Les matières

Module III (30 hours)

Faites du sport ! : Donner des conseils - Les parties du corps - Les mouvements - Les sports

SEMESTER III

COMMON COURSE II- HINDI

HN3AO5B18 - NAATAK AUR LAMBI KAVITHA

Credits – 4

Total Lecturer Hours - 90

Course Outcomes:

Upon completion of this course, the student will be able to

CO1: Summarise the poems and illustrate the socio-political and cultural concerns of the author

CO2: Discuss the Authors contribution to Hindi Literature

CO3: Analyse the characterisation of the Drama Konark

CO4: Critique excerpts of the poems and Drama

CO5: Communicate in oral and written form of Hindi with competence.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	1	3	1
CO2	1	1	1	3	1
CO3	1	1	1	3	1
CO4	1	1	1	3	1
CO5	1	1	1	3	1

Module- I

22 Hours

Syllabus- Konark Introduction & Act 1 (Jagdishchandra Mathur)

Module- II

24 Hours

Syllabus- - Konark Act 2 & 3(Jagdishchandra Mathur)

Module- III

22 Hours

Syllabus-

Nagayi Mahura (Thrilochan)

Shahenshah Ki Neend (Umashankar Chaudhary)

Dhaaba- Nilesch Raghuvanshi

Module- IV

22 Hours

Syllabus-Ithni Door Mat Bhyahna Baba- Nirmala Putul

Jawahar Tunnel – Agnishekhar

സെമസ്റ്റർ : മൂന്ന്

കോമൺ കോഴ്സ് മലയാളം
ബി.എ/ബി.എസ്.സി (റഗുലർ), ബി.എസ്.സി സൈക്കോളജി (സ്വാശ്രയം)

MA3A05B18- ദൃശ്യകലാസാഹിത്യം

Credits: 4

Total Lecture hours: 90

പഠനനേട്ടങ്ങൾ (Course Outcomes)

CO1: കേരളീയരംഗകലാപാരമ്പര്യവും സംസ്കാരപരിണാമവും ചർച്ചചെയ്യുക

CO2: ദൃശ്യകലാപഠനത്തിലൂടെ കേരളീയസംസ്കാരപരിണാമം, ചരിത്രം എന്നിവ അപഗ്രഥിക്കുക

CO3: കഥാപാത്രപഠനത്തിലൂടെ സമകാലികവിഷയങ്ങളെ വിലയിരുത്തുക

CO4: ഇതിവൃത്ത പഠനത്തിലൂടെ കഥാപാത്രങ്ങളെ വിമർശനാത്മകമായി നിരൂപണം ചെയ്യുക

CO5: സമകാലികസംഭവങ്ങളെ അടിസ്ഥാനമാക്കി നാടകം, ഹൃസ്വചിത്രം എന്നിവ തയ്യാറാക്കുക.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	1	3	1
CO2	1	1	1	3	1
CO3	1	1	1	3	1
CO4	1	1	1	3	1
CO5	1	1	1	3	1

പാഠഭാഗങ്ങൾ

ഖണ്ഡം ഒന്ന് - സംസ്കൃത നാടകം

20 മണിക്കൂർ.

മലയാളശാസ്ത്രവും നാലാമങ്കം - എ. ആർ രാജ രാജ വർമ

ഖണ്ഡം രണ്ട് - ആട്ടക്കഥ

15 മണിക്കൂർ

നളചരിതം (ഒന്നാം ദിവസം) - ഉണ്ണായി വാര്യർ (തുടക്കം മുതൽ ഹംസം നളനിലുള്ള പ്രണയം ഉറപ്പിക്കുന്നത് വരെ)

ഖണ്ഡം മൂന്ന് - തുള്ളൽ

15 മണിക്കൂർ

കല്യാണസൗഗന്ധികം (ശ്രീതങ്കൻ തുള്ളൽ) - കുഞ്ചൻ നമ്പ്യാർ - (ഭീമൻറെ കദളീവന പ്രവേശം മുതൽ ശ്രീരാമ ദാസൻറെ വംശേ ജനിക്കയാൽ പാരം നിനക്കു മഹാഭാവമിങ്ങനെ' വരെ ഭാഗങ്ങൾ

ഖണ്ഡം നാല് - മലയാള നാടകം

20 മണിക്കൂർ

1128 ൽ ക്രൈം 27 - സി. ജെ. തോമസ്

ഖണ്ഡം അഞ്ച്- സിനിമ

20 മണിക്കൂർ

നിർമാല്യം തിരക്കഥ - എം. ടി. വാസുദേവൻ നായർ

SEMESTER III
COMPLEMENTARY COURSE- II

BO3C01B18 -ANGIOSPERM TAXONOMY AND ECONOMIC BOTANY

Credits: 3

Total lecture hours - 54 hrs

Course Outcomes:

CO1: Explain the morphological characters of angiosperms and distinguish the plant species based on their characteristic features.

CO2: Classify the angiosperm families based on Bentham and Hooker's classification and explain about the common angiosperm species of Kerala.

CO3: Compare the morphologically useful parts of plants having economic importance and classify the economically important plants of Kerala according to their uses.

CO4: Justify the use of medicinal plants for the treatment of various ailments by folkloric medicine and compare the morphologically important parts used for it.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	2	1	2
CO2	1	1	2	1	3
CO3	1	1	2	1	3
CO4	1	1	2	1	3

SEMESTER III

COMPLEMENTARY COURSE- II

CH3C01B18: INORGANIC AND ORGANIC CHEMISTRY

Credits: 3

Total lecture hours - 54 hrs

Course Outcomes:

CO1: Explain the nuclear stability, fission and fusion processes and applications of radioactive isotopes.

CO2: Summarize the biochemical reactions taking place during photosynthesis and respiration and the role of metal ions in biological processes.

CO3: Explain the classification, uses and toxic effects of drugs, cosmetics, food additives, fertilizers and pesticides.

CO4: Illustrate the preparation, properties, structure and aromaticity of furan, pyrrole and pyridine.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PS01	PS02	PS03	PS04	PS05
CO1	1	1	1	1	3
CO2	1	2	1	1	2
CO3	1	1	1	1	2
CO4	1	1	2	1	3

Syllabus Content:

Module I : Nuclear Chemistry

(12 Hrs)

Nuclear Stability - Mass defect, Binding energy, Nuclear forces, Magic number, Packing fraction, n/p ratio. Natural and induced radioactivity, radioactivity – detection, Units of radioactivity. Modes of decay – Group displacement law. Isotopes, isobars and isotones with examples. Nuclear

fission - Atom bomb – Nuclear fusion – Hydrogen bomb - Nuclear reactors - Nuclear reactors in India. Application of radioactive isotopes – ^{14}C dating – Rock dating – Isotopes as tracers – Radio diagnosis and radiotherapy.

Module II: Bioinorganic Chemistry and Agricultural Chemistry (18 Hrs)

Bioinorganic Chemistry: Thermodynamics of Living cell- Exergonic and endergonic reactions. Metal ions in biological systems - Biochemistry of iron – Metalloporphyrins - Haemoglobin and myoglobin, pH of blood, cytochromes, Ferredoxine - Mechanism of O_2 and CO_2 transportation - Chlorophyll and photosynthesis (mechanism not expected) elementary idea of photophosphorylation. Photosynthesis and respiration – comparison. – Elementary idea of structure and mechanism of action of sodium potassium pump. Biochemistry of zinc and cobalt.

Chemistry and Agriculture: Fertilizers - NPK, superphosphates, triple super phosphate, uses of mixed fertilizers, micronutrients and their role, bio-fertilizers, plant growth hormones.

Pesticides - Classifications with simple examples, Biopesticides. Insecticides – stomach poisons, contact insecticides, fumigants. Method of preparation and use of DDT. Herbicides - function of 2, 4,-D and 2,4,5 –T, Fungicides - inorganic and organic- Bordeaux mixture. Excessive use of pesticides – environmental hazards.

Module III : Heterocyclic Compounds (8 Hrs)

Aromaticity – Huckel's rule, preparation (any one method), properties, structure and aromaticity of furan, pyrrole and pyridine.

Module IV: Drugs (8 Hrs)

Classification of drugs. Structure, therapeutic uses and mode of action (synthesis not required) of Antibiotics: Ampicillin, Sulpha drugs: Sulphanilamide, Antipyretics: Paracetamol, Analgesics: Aspirin, Antacids: Ranitidine, Antimalarials: Chloroquine and Anti-cancer drugs: Chlorambucil. Psychotropic drugs: Tranquilizers, antidepressants and stimulants with examples. Drug addiction and abuse. Prevention and treatment.

Module V: Food Additives and Cosmetics

(8 Hrs)

Food Additives: Food preservatives, artificial sweeteners, flavours, emulsifying agents, antioxidants, leavening agents and flavour enhancers (definition and examples, structures not required) – Structure of BHT, BHA and MSG - Commonly used permitted and non-permitted food colours (structures not required) - Fast foods and junk foods & their health effects – Soft drinks and their health effects.

Cosmetics: Introduction. Dental cosmetics, Shampoos, Hair dyes, Skin products, Shaving cream, Talcum powder, Perfumes and Deodorants (health effects).

SEMESTER III

CORE COURSE III

ZY3B03B18: ANIMAL DIVERSITY –CHORDATA

Credits – 3

Duration: One Semester

Total Lecture Hours: 54

Course outcome

CO1: Summarize general characters, origin and outline classification of Chordata.

CO2: Compare general characters and classification of Vertebrata.

CO3: Distinguish different Orders coming under Tetrapoda.

CO4: Illustrate salient characteristics of mammals and classify them into different orders.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
C01	3	1	2	1	2
C02	3	1	2	1	2
C03	3	1	2	1	2
C04	3	1	2	1	2

Syllabus Content

MODULE I

Introduction

(1 Hr)

General Characters and outline classification of Chordata up to class,

Origin of Chordates – mention theories in brief

Protochordates

General characters and Classification

(2 Hrs)

1. Sub phylum: Urochordata

Class I Larvacea Eg. Oikopleura

Class II Ascidiacea Eg: Ascidia (Mention Retrogressive Metamorphosis)

Class III Thaliacea Eg: Doliolum

2. Sub phylum: Cephalochordata (2 Hrs)

Example - Amphioxus (Structure and affinities)

MODULE II

3. Sub phylum: Vertebrata General characters and Classification (2 Hrs)

4. Division 1– Agnatha

Class I Ostracodermi Eg: Cephalaspis

Class II Cyclostomata Eg: Petromyzon

Division 2 - Gnathostomata (10 Hrs)

Super class Pisces

General Characters and Classification

Class: Chondrichthyes - General Characters

Sub class - Elasmobranchi Eg: Narcine

Sub class - Holocephali Eg: Chimaera

Class: Osteichthyes - General Characters

Sub class - Choanichthyes

Order 1 Crossopterygii (Coelocanth) Eg: Latimeria (Evolutionary Significance)

Order 2 Dipnoi Eg: Lepidosiren - Distribution, affinities and systematic position of lung fishes.

Sub class: - Actinopterygii

Super order 1. Chondrostei Eg: Acipenser

Super order 2. Holostei Eg: Amia

Super order 3. Teleostei Eg: Sardine

General topics

1. Accessory respiratory organs in fishes.
 2. Parental care in fishes.
 3. Scales in fishes.
 4. Migration in fishes
-

MODULE III

Super class: Tetrapoda General characters, Classification up to Orders (11 Hrs)

Class Amphibia - Type Frog (*Euphlyctis hexadactylus*)

Order I : Anura Eg: Hyla

Order II :Urodela Eg: Amblystoma (mention axolotl larva and Paedomorphosis /neotony)

Order III Apoda Eg: Ichthyophis.

Class Reptilia (4 Hrs)

Sub class I: Anapsida

Order Chelonia Eg: Chelone

Sub class II: Parapsida Eg: Ichthyosaurus

Sub class III: Diapsida

Order I Rhynchocephalia Eg: Sphenodon

Order II Squamata Eg: Chamaleon

Order III. Crocodilia Eg..Crocodylus

Sub class IV: Synapsida Eg: Cynognathus

General topic

Identification of poisonous and non-poisonous snakes

Poisonous and non-poisonous snakes

Class Aves (5 Hrs)

Sub class I: Archeornithes Eg: Archaeopteryx (Affinities)

Sub class II: Neornithes

Super order I: Palaeognathe Eg: Struthio

Super order II: Neognathe Eg: Brahminy kite

General topics

1. Migrations in birds

2. Flight adaptations in birds

MODULE IV

Class Mammalia Type: Rabbit (*Oryctolagus cuniculus*) (17 Hrs)

Brief mention of general characters and classification up to order with example. (Mention any five salient features of each order, detailed accounts of examples are not necessary) Sub class I:

Prototheria Eg: Echidna, Ornithorhynchus

Sub class II: Metatheria Eg: Macropus

Sub class III: Eutheria

Order 1 Insectivora Eg: Talpa

Order 2 Dermoptera Eg: Galeopithecus

Order 3 Chiroptera Eg: Pteropus

Order 4 Primates Eg: Loris

Order 5 Carnivora Eg: Panthera

Order 6 Edentata Eg: Armadillo

Order 7 Pholidota Eg: Manis

Order 8 Proboscidea Eg: Elephas

Order 9 Hydracoidea Eg: Procavia

Order 10 Sirenia Eg: Dugong

Order 11 Perissodactyla Eg: Rhinoceros

Order 12 Artiodactyla Eg: Camelus-mention ruminant stomach

Order 13 Lagomorpha Eg: Oryctolagus

Order 14 Rodentia Eg: Hystrix (Porcupine)

Order 15 Tubulidentata Eg: Orycteropus

Order 16 Cetacea Eg: Delphinus

General topics

1. Dentition in Mammals
2. Aquatic Mammals and their adaptations.

SEMESTER IV

Course Code	Course Title	Credits	Course Type
EN4A06B18	Illuminations	4	Common Course I
FR4A06B18	An Advanced course in French –II	4	Common Course II
HN4A06B18	Gadya Aur Ekanki	4	
MA4A06B18	Malayala Gadhyarachanakal	4	
CH4C01B18	Advanced Bio-Organic Chemistry	3	Complementary Course I
CH4CP01B18	Organic Chemistry Practicals	2	Complementary Course Practical
BO4C01B18	Anatomy and Applied Botany	3	Complementary Course II
BO4CP01B18	Angiosperm Taxonomy, Economic botany, Anatomy and Applied Botany (Practical)	2	Complementary Course Practical
ZY4B04B18	Research methodology, Biophysics & Biostatistics	3	Core Course
ZY4BP02B18	Animal Diversity –Chordata, Research methodology, Biophysics & Biostatistics	2	Core Practicals

SEMESTER IV

COMMON COURSE I

EN4A06B18 – Illuminations

Credits: 4

Total Lecture Hours: 90

Course Outcomes:

CO1: Discover life lessons through the study of life sketches.

CO2: Explain multiple perspectives of life from the viewpoint of great minds.

CO3: Apply the language skills acquired in academic and non-academic contexts.

CO4: Analyze creative texts with a special focus on human emotions and the spirit of survival.

CO5: Critique the conventional notions of happiness, courage and failure.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	1	3	1
CO2	1	1	1	3	1
CO3	1	1	1	3	1
CO4	1	1	1	3	1
CO5	1	1	1	3	1

Syllabus Content

Module I- Life Sketches

(18 hours)

Helen Keller: Three Days to See

Jesse Owens: My Greatest Olympic Prize

Thus Spoke Sudarshan: An Interview with God's Own Physicist Compiled from E C G

Sudarshan's interviews

Module II- Essays (18 hours)

Stephen Leacock: Are the Rich Happy?

A.G. Gardiner: On Courage

Module III- Speeches (18 hours)

Lafcadio Hearn: On Reading

J.K. Rowling: The fringe benefits of failure and the importance of imagination

Chimamanda Ngozi Adichie: An Ode to Makeup

Module IV- Short Stories (18 hours)

Oscar Wilde: The Nightingale and the Rose

George Orwell: Roucolle, the Miser

John Galsworthy: Quality

Alice Walker: Everyday Use

Module VI- Poems (18 hours)

William Ernest Henley: Invictus

Robert Frost: The Road Not Taken

Kahlil Gibran: Of Good and Evil

Maya Angelou: Still I Rise

SEMESTER IV

COMMON COURSE II

FR4A06B18-AN ADVANCED COURSE IN FRENCH II

Credits: 4

Total Lecture Hours: 90 hours

Course Outcomes:

CO1: Develop language, vocabulary and grammar skills.

CO2: Prepare conversations based on various situations and speak about them.

CO3: Articulate the concepts to express one's opinion in a specific situation.

CO4: Ask questions to get meaningful responses in effective communication.

CO5: Describe events or topics based on various daily life situations such as persons, family, time schedules, visiting countries

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	1	3	1
CO2	1	1	1	3	1
CO3	1	1	1	3	1
CO4	1	1	1	3	1
CO5	1	1	1	3	1

Syllabus Content:

Module I (30 Hours)

En voiture Proposer – Accepter – Refuser – Faire des projets- Les routes – La voiture

Module II (30 Hours)

Sur la route Exprimer l'obligation/ L'interdiction – La météo– Le temps

Module III

(30 Hours)

Raconter un emploi du temps Se justifier – Le tourisme - Les pays et les continents

SEMESTER IV

COMMON COURSE II

HN4AO6B18 - GADYA AUR EKAANKI

Credits: 4

Total Lecture Hours: 90

Course Outcomes:

CO1: Discuss the authors contribution to Hindi Literature

CO2: Summarise the central theme and other relevant details of all literary works.

CO3: Illustrate the socio-political and cultural concerns of the Author

CO4: Critique excerpts of the Prose and One Act Plays

CO5: Communicate in oral and written form of Hindi with competence.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	1	3	1
CO2	1	1	1	3	1
CO3	1	1	1	3	1
CO4	1	1	1	3	1
CO5	1	1	1	3	1

Syllabus Content:

Module- I (22 hours)

1. Aaiye hum vriksh devta ki aaradhana karen- Dr. Kishorilal vyas
2. Raajniti ka batvaara- Harishankar parsai
3. Deep daan – Ramkumar verma

Module- II (24 hours)

4. Himachadit uttung shikhar aur dhuli hariyali – Vijay kumar sandesh
5. Kaphan chor ka beta – Ushabaala
6. Bahu ki vida- Vinod rastogi

Module- III (22 hours)

7. Jab mai fail hua- Ramkumar Verma
8. Jaan se pyare – Mamta Kaaliya
9. Sati – G.K. Harjeeth

Module- IV (22 hours)

10. Jab intizar hussain apni janmabhoomi laute – Azhar vajahat
11. Hari ghaas par ghante bhar – Surendra verma

SEMESTER IV
COMMON COURSE II

MA4A06B18 - മലയാള ഗദ്യരചനകൾ

Credits: 4

Total Lecture Hours: 90

Course Outcomes:

CO1: മലയാള ഗദ്യസാഹിത്യത്തിലെ സമകാലിക വിഷയങ്ങൾ ചർച്ച ചെയ്യുക

CO2: കേരളീയസംസ്കാര - കലാപരിണാമം , ചരിത്രം, ആത്മകഥ എന്നിവ അപഗ്രഥിക്കുക

CO3: ഗദ്യപാഠങ്ങളിലൂടെ സമകാലികവിഷയങ്ങളെ വിലയിരുത്തുക

CO4: സമകാലിക സാമൂഹിക വിഷയങ്ങളെ വിമർശനാത്മകമായി നിരൂപണംചെയ്യുക

CO5: വിവിധ വിഷയങ്ങളെ ആസൂത്രമാക്കി ലേഖനങ്ങൾ തയ്യാറാക്കുക. സ്വാതന്ത്ര്യവേദങ്ങൾ വിവിധ ആഖ്യാന രൂപങ്ങളിലൂടെ ആവിഷ്കരിക്കുക.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	1	3	1
CO2	1	1	1	3	1
CO3	1	1	1	3	1
CO4	1	1	1	3	1
CO5	1	1	1	3	1

പാഠഭാഗങ്ങൾ

പുസ്തകങ്ങൾ : ഗദ്യാരാമം , ഓർമ്മകൾ ചന്ദനഗന്ധം പോലെ

ഖണ്ഡം ഒന്ന്

15 മണിക്കൂർ

1. കാളിദാസനും കാലത്തിന്റെ ദാസൻ - ജോസഫ് മുണ്ടശ്ശേരി
2. മേഘസന്ദേശവിവർത്തനങ്ങൾ - ഡോ. എൻ .അജയകുമാർ
3. മാതൃഭാഷയിലേക്കു വീണ്ടും - എൻ .വി . കൃഷ്ണവാര്യർ

ഖണ്ഡം രണ്ട്

20 മണിക്കൂർ

1. വാക്കുകളുടെ വിസ്മയം - എം .ടി.വാസുദേവൻനായർ
2. മാറുന്ന മലയാള സംസാരഭാഷ - ടി .ബി .വേണുഗോപാലപ്പണിക്കർ
3. നമ്മുടെ അടുക്കള തിരിച്ചുപിടിക്കുക - സാറാ ജോസഫ്
4. കലയും കലാദർശനവും - ഡോ. ജെ . ഉണ്ണികൃഷ്ണപിള്ള

ഖണ്ഡം മൂന്ന്

15 മണിക്കൂർ

1. ചെന്നൈ വൈദ്യനാഥ ഭാഗവതർ സംഗീതത്തിലെ സിംഹനാദം - ഇന്ദിരാമേനോൻ
2. ഈശ്വരപിള്ളയെ ആരോർക്കുന്നു - പി. കെ . രാജശേഖരൻ
3. രവിവർമ്മ - വിജയകുമാർ മേനോൻ

ഖണ്ഡം നാല്

15 മണിക്കൂർ

1. പ്രകാശത്തിന്റെ ആയിരം തടവറകൾ - ജീവൻ ജോബ് തോമസ്
2. ജനാധിപത്യ വിദ്യാഭാസം ചില ചിന്തകൾ - ഡോ. കെ .എൻ. പണിക്കർ
3. ഞങ്ങൾ നിങ്ങൾക്ക് ഭൂമി വിറ്റാൽ - സിയാറ്റിൽ മുപ്പൻ

ഖണ്ഡം അഞ്ച്

25 മണിക്കൂർ

1. ഓർമ്മകൾ ചന്ദനഗന്ധം പോലെ - ബി. സരസ്വതിയമ്മ

SEMESTER IV

COMPLEMENTARY COURSE I

CH4C01B18: ADVANCED BIO-ORGANIC CHEMISTRY

Credits: 3

Total lecture hours - 54 hrs

Course Outcomes:

CO1: Summarize the classification, isolation and properties of essential oils, alkaloids and lipids.

CO2: Explain the structure, classification and biological functions of Amino acids, proteins, enzymes, nucleic acids, vitamins, steroids and hormones.

CO3: Summarize the preparation, properties and configuration of glucose, fructose, sucrose, starch and cellulose.

CO4: Explain the classification, cleaning action and environmental effects of soaps and detergents.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	1	1	3
CO2	1	1	2	1	3
CO3	1	1	2	1	3
CO4	1	1	2	1	3

Syllabus Content:

Module I : Natural Products

(12 Hrs)

Terpenoids: Classification with examples – Isoprene rule – Isolation of essential oils by steam distillation – Uses of lemongrass oil, eucalyptus oil and sandalwood oil - Source, structure and uses of citral and geraniol.

Alkaloids: Classification – Isolation, general properties. Source, structure and physiological activity of nicotine, coniine and piperine.

Lipids: Classification – Oils, fats and waxes (definition, structure, biological functions and examples). Hydrogenation and Rancidity - Acid value, Saponification value and Iodine value –. Biological functions of phospholipids and glycolipids

Soaps and Detergents: Soaps – Types of soaps. Cleansing action of soaps. Synthetic detergents - Classification. Comparison between soaps and detergents. Environmental aspects.

Module II: Amino Acids and Proteins

(12 Hrs)

Amino acids: Classification – Zwitter ion formation and isoelectric point- Synthesis of glycine, alanine, and phenyl alanine (any one method). Peptides: Peptide bond. Synthesis of peptides (upto dipeptides). Proteins: Classification of proteins – Primary, secondary and tertiary structure of proteins – Denaturation of proteins – Tests for proteins.

Module III : Enzymes and Nucleic Acids

(9 Hrs)

Enzymes: Nomenclature, classification and characteristics. Mechanism of enzyme action. Theory of enzyme catalysis – Michaelis-Menten theory. Cofactors and coenzymes. Enzyme inhibitors. Uses of enzymes.

Nucleic acids: Structure of pentose sugar, nitrogenous base, nucleoside and nucleotide – Double-helical structure of DNA – Differences between DNA and RNA. Biological Functions – Replication and protein biosynthesis. Transcription and Translation. Genetic code.

Energy rich molecules: Elementary structure of ATP, ADP and AMP.

Module IV : Carbohydrates

(12 Hrs)

Classification with examples. Preparation and properties of glucose, fructose and sucrose. Cyclic structures and Haworth projections of glucose, fructose, maltose and sucrose (ring size determination not expected). – Mutarotation. Conversion of glucose to fructose and vice versa. –

Structure of starch and cellulose (structure elucidation not expected). Industrial applications of cellulose.

Module V: Vitamins, Steroids and Hormones

(9 Hrs)

Vitamins: Classification. Structure, biological functions and deficiency diseases of vitamins A, B₁, B₂, B₃, B₅, B₆, B₁₂ (structure not required), C and D.

Steroids: Introduction. Structure and functions of cholesterol. Elementary idea of HDL and LDL. Bile acids.

Hormones: (only examples and biological functions needed. Structures are not needed.) Introduction. Steroid hormones, peptide hormones and amine hormones (examples, endocrine gland and biological functions, structure not required). Artificial hormones (elementary study only).

SEMESTER IV
COMPLEMENTARY COURSE PRACTICAL
CH4CP01B18- ORGANIC CHEMISTRY PRACTICALS

Credit – 2

Total Hours: 72 Hrs

Course Outcomes:

CO1: Determine the heteroatoms present in an organic compound.

CO2: Identify the functional groups present in an organic compound.

CO3: Recall method of preparation of solid derivative of the analyzed organic compound.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	2	1	3
CO2	1	1	2	1	3
CO3	1	1	2	1	3

Syllabus Content:

1. Tests for elements: Nitrogen, Halogen and Sulphur
2. Determination of physical constants
3. Study of reactions of common functional groups.
4. Qualitative analysis with a view to characterization of functional groups and identification of the following compounds: Naphthalene, anthracene, chlorobenzene, benzyl chloride, p-dichlorobenzene, benzyl alcohol, phenol, o-, m- and p- cresols, α -naphthol, β -naphthol, resorcinol, benzaldehyde, acetophenone, benzophenone: benzoic acid, phthalic acid, cinnamic acid, salicylic acid, ethyl benzoate, methyl salicylate, benzamide, urea, aniline,

o-, m- and p- toluidines, dimethyl aniline, nitrobenzene, o-nitrotoluene, m-dinitrobenzene and glucose. (minimum of ten compounds to be analysed).

5. Organic preparation involving halogenation, nitration, oxidation, reduction, acetylation, benzylation, hydrolysis, diazotization. (non- evaluative)
6. Isolation of an organic compound from a natural source. (non- evaluative)

SEMESTER IV

COMPLEMENTARY COURSE II

BO4C01B18 - ANATOMY AND APPLIED BOTANY

Credits- 3

Total Lecture Hours – 54

Course Outcomes

CO1: Identify the differences in the anatomy of root and stem of dicots and monocots with special reference to its primary and secondary structure.

CO2: Classify the plants into different ecological groups based on their morphological and anatomical adaptations.

CO3: Apply the crop improvement practices in plant breeding like hybridization and plant propagation methods in real life scenario

CO4: Analyze the various principles, practices involved in the tissue culture and its significance

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	2	1	3
CO2	1	1	2	1	3
CO3	1	1	2	1	3
CO4	1	1	2	1	3

Syllabus Content:

PLANT ANATOMY (34 hrs)

Module 1: Cells and Tissues (9 hrs)

Gross structure of primary and secondary cell walls; structure and function of Plasmodesmata; non- living inclusions - cystolith, raphides; Tissues - meristematic and permanent, types of

meristems; simple and complex tissues, secretory tissues (nectaries, hydathodes, mucilage ducts and lactiferous tissue)

Module 2: Anatomy of Plant Organs (16 hrs)

Primary structure of stem and root in dicots and monocots; anatomy of monocot and dicot leaf. Secondary thickening in dicot stem and dicot root; growth rings, dendrochronology, heart wood and sap wood; tyloses; hard wood and soft wood.

Anomalous secondary thickening in Bignonia.

Module 3: Ecological Anatomy (9 hrs)

Study of the morphological and anatomical adaptations of the following groups: Hydrophytes – Nymphaea, Hydrilla; Xerophytes – Nerium; Epiphytes – Vanda; Halophytes – Avicennia/Rhizophora.

APPLIED BOTANY (20 hrs)

Module 4: Plant Breeding (14 hrs)

Objectives of plant breeding, methods of plant improvement - plant introduction, acclimatization, plant quarantine; selection - mass selection, pureline selection and clonal selection; hybridization-intervarietal, interspecific and intergeneric; procedure of hybridization.

Artificial vegetative propagation methods. Propagation of plants through cutting, layering - air layering; budding T and patch budding; grafting - tongue and splice grafting. Role of cambium in budding and grafting.

Module 5: Plant Tissue Culture (6 hrs)

Principles of tissue culture, micropropagation - different steps - selection of explants, culture media, sterilization (explants and culture media), callus. Regeneration of plants: organogenesis, somatic embryogenesis; artificial seeds. Applications of plant tissue culture.

SEMESTER IV

COMPLEMENTARY COURSE PRACTICAL

**BO4CP01B18- ANGIOSPERM TAXONOMY, ECONOMIC BOTANY, ANATOMY AND
APPLIED BOTANY**

Credits- 2

Total Lecture Hours – 36

Course Outcomes

CO1: Distinguish the plants of various categories based on their morphological, ecological and anatomical features.

CO2: Practice the emasculation and plant propagation techniques to produce desirable traits in the plants.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	2	1	2
CO2	3	1	2	1	3

Syllabus Content

1. Primary structure of stem and root of dicots and monocots; Dicot stem - Centella; Monocot stem – Bamboo, grass, asparagus; Dicot root - Tinospora; Monocot root - Colocasia, Musa.
 2. Structure of dicot stem and dicot root after secondary thickening; Stem - Vernonia, Eupatorium; Root - Tinospora, Papaya.
 3. Anomalous secondary thickening in Bignonia.
 4. Anatomical adaptations of Hydrophytes - Nymphaea petiole, Hydrilla stem; Xerophytes - Nerium Leaf; Epiphytes - Velamen root of Vanda; Halophyte – Pneumatophore of Avicennia.
 5. Emasculation of pea or Caesalpinia flower.
 6. Demonstrate T and patch budding.
 7. Demonstration of tissue culture techniques: culture media, surface sterilization and inoculation of explants.
 8. Identification of non-living inclusions – cystolith and raphides.
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SEMESTER IV

CORE COURSE

ZY4B04B18-RESEARCH METHODOLOGY, BIOPHYSICS AND BIOSTATISTICS

Credits: 3

Total Lecture Hours: 54

Course Outcomes:

CO1: Employ basic methodology of research and bioethics in research.

CO2: Design experiment employing animal collection methods.

CO3: Compare different types of microscopes and separation techniques

CO4: Apply principles of Biostatistics in solving problems

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	1	1	3
CO2	3	1	2	1	3
CO3	3	1	2	1	2
CO4	3	3	1	1	3

Syllabus Content

RESEARCH METHODOLOGY

Module I

13 Hrs

Basic concepts of research: Meaning, Objectives, Approaches, Types of research. Research Process: Scientific method in research (eight steps). Importance of literature reviewing in defining a problem, Identifying gap areas from literature review. Research Communication and scientific documentation: Project proposal writing, Research report writing, (Structure of a scientific paper), Thesis, dissertation, research article. Presentation techniques: Oral presentation, Assignment, Seminar, Debate, Workshop, Colloquium, Conference. Sources of Information: Primary and

secondary sources. Library- Books, Journals, Periodicals, Reviews, Internet. Search engines, Online libraries, e-Books, e-Encyclopedia, Institutional Websites. Plagiarism

Module II

12 Hrs

Animal Collection – Tools & techniques. Sampling techniques. Quadrate Line transect Measurements -Density Abundance Frequency- Biodiversity indices – concepts Simpson index. Collection methods, techniques and equipments-Plankton, Insects, Fish, Bird Preservation techniques – Taxidermy Rearing techniques. Laboratory and field Units of measurements- units, SI system, Equivalent weight, normality, molarity

BIOPHYSICS

Module III

14 Hrs

Basic understanding on principle and uses of the following:

Microscopy

(a) Light microscopy, Parts of a microscope, Dry and Oil immersion objectives, Bright field (Compound Microscope), Phase contrast, Dark field microscopy, Fluorescence, Polarization microscopy, Video microscopy.

(b) Electron - Scanning (SEM), Transmission (TEM) and STEM Micrometry – Stage and Eyepiece micrometers Camera Lucida

Instrumentation: pH Meter

Separation Techniques: Centrifuge, Chromatography, Electrophoresis

Analytical techniques: Colorimeter, Spectrophotometer, X-ray crystallography

BIOETHICS

Module IV

5 Hrs

Bioethics : Introduction, Animal rights and animal laws in India, Prevention of cruelty to animals Act 1960, Biodiversity Act 2003.

Concept of 3 R – conservation (Refined- to minimize suffering, Reduced – to minimize animals, Replaced – modern tools and alternate means), Animal use in research and education.

Laboratory animal use, care and welfare, Animal protection initiatives- Animal Welfare Board of India, CPCSEA, ethical commitment. Working with human: Consent, harm, risk and benefits.

BIOSTATISTICS

Module V

10 Hrs

Sample & Sampling techniques: Collection of data, classification of data, frequency distribution tables, graphical representation: - Bar diagrams, Histogram, Pie diagram and Frequency curves - Ogives.

Measures of Central Tendency: Mean, Median, Mode (Problem - Direct method only) Measures of dispersion: Range, Quartile Deviation, Mean Deviation, Standard Deviation, Standard error. (Merits & demerits and problems on SD).

Correlation: Definition, Types of correlation.(mention in brief) Test of Hypothesis and Test of Significance: Basic concept, Levels of significance, test of significance, Procedure for testing hypothesis, types of hypothesis- Null hypothesis and Alternate hypothesis.

SEMESTER IV

CORE PRACTICAL

**ZY4BP02B18-ANIMAL DIVERSITY – CHORDATA, RESEARCH METHODOLOGY,
BIOPHYSICS & BIOSTATISTICS**

Credits – 2

Total Hours: 72

Course Outcomes:

CO1: Identify, classify and sketch chordates.

CO2: Compare vertebrate systems.

CO3: Identify animal collection tools, techniques and major laboratory equipments.

CO4: Calibrate and measure microscopic objects using micrometer.

CO5: Construct diagrams and solve problems applying statistical principles.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	3	1	2
CO2	3	1	3	1	2
CO3	3	1	3	1	3
CO4	1	3	3	1	3
CO5	1	3	3	1	3

ANIMAL DIVERSITY –CHORDATA

1. Scientific Drawing

Make scientific drawing of 5 locally available vertebrate specimens belonging to different classes

2. Dissections

Frog: Photographs/diagrams/one dissected & preserved specimen each/models may be used for study.

- a. Frog Viscera
- b. Frog Digestive System
- c. Frog Arterial System
- d. Frog 9th & 1st Spinal nerve
- e. Frog Sciatic Plexus
- f. Frog Brain

3. Mounting of placoid scales; study of cycloid and ctenoid scales

4. Osteology

Frog vertebrae - typical, atlas, 8th, 9th and Urostyle.

Rabbit – Atlas, Axis and typical vertebra

Pectoral and pelvic girdles of Frog and Rabbit/ Bird - Keel and Synsacrum

Turtle/Tortoise - plastron and carapace

5. Study of sections.

Amphioxus T. S. through pharynx/T.S. through intestine

6. Identification

Identify, classify and describe the following animals by their generic names and 30 % of them by their scientific names.

Protochordata-1, Pisces-5, Amphibia-5, Reptilia- 5, Aves-2, Mammalia-2.

Taxonomic identification with key:-

- i) Identification of fishes up to the level of order.
- ii) Identification of snakes up to family

RESEARCH METHODOLOGY, BIOPHYSICS & BIOSTATISTICS

PART A - RESEARCH METHODOLOGY

Animal collection Tools, Techniques & Estimation

1. Quadrate study
2. Transect study
3. Sampling Methods

4. Species area curve

5. Simpson index

PART B - BIOPHYSICS

1. Study of simple and compound light microscopes

2. Micrometry –calibration and measurement of microscopic objects –low power

3. Camera Lucida (draw a few diagrams using Camera Lucida)

4. Paper chromatography (demonstration only)

5. Instrumentation – demonstration (write notes on principle, equipment and its use) pH

Meter, Colorimeter/ Spectrophotometer, Centrifuge

PART C - BIOSTATISTICS

1. MS Excel: To create mean and median, Construction of bar diagram, Pie diagram and Line graphs.

2. MS Access: To create grade of students

3. Internet: Access a web page on any biological topic.

4. Frequency distribution of the given samples to find out arithmetic mean, median, mode.

5. Range and standard deviation for a biological data

6. Correlation using any biological data.

7. Graphical representation of data. Construction of bar diagrams, Histograms, Pie diagram and Line graphs.

SEMESTER V

Course Code	Course Title	Credits	Course Type
ZY5B05B18	Environmental Biology & Human Rights	3	Core Course 5
ZY5B06B18	Cell Biology & Genetics	3	Core Course 6
ZY5B07B18	Evolution, Ethology & Zoogeography	3	Core Course 7
ZY5B08B18	Human Physiology, Biochemistry & Endocrinology	3	Core Course 8
ZY5D01aB18	Human Genetics, Nutrition And Public Health	3	Open course Offered by the Department
ZY5D01bB18	Vocational Zoology	3	Open course Offered by the Department
ZY5D01cB18	Man, Nature And Sustainable Development	3	Open course Offered by the Department

SEMESTER V

CORE COURSE

ZY5B05B18: ENVIRONMENTAL BIOLOGY AND HUMAN RIGHTS

Credits: 3

Total Lecture Hours: 54

Course Outcomes:

CO1: Explain the concepts of Ecosystem and renewable resources.

CO2: Discuss the concepts of Population, community and animal interaction.

CO3: Distinguish biodiversity, articulate the measures for conservation of biodiversity and explain various environmental issues

CO4: Explain the basic concepts and provisions of human rights

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	2	1	2
CO2	3	1	2	1	2
CO3	3	1	2	1	3
CO4	3	1	1	1	1

Syllabus Contents

MODULE 1: ECOSYSTEM

12 Hrs

Basic concepts of ecosystem Components of ecosystem: Abiotic (Sunlight, temperature, soil, water, atmosphere) and Biotic components (Producers, consumers, decomposers). Ecological pyramid- number, biomass, energy. Functions of ecosystem: Productivity - Food chain - Food web - Energy flow - Laws of Thermodynamics. Types of Ecosystem: Terrestrial - Forest – Grassland - Desert, Aquatic – Marine - Fresh water, Wetland and Biome. Concept of limiting factors: Liebig's and Shelford's laws of limiting factors. Biogeochemical cycles: Concept, gaseous and sedimentary cycles, Carbon cycle, Nitrogen cycle. Renewable resources (solar, wind, hydroelectric, biomass and geothermal) and Nonrenewable resources (mineral and metal ore, fossil fuels).

MODULE 2: CONCEPTS OF POPULATION AND COMMUNITY

8 Hrs

Concept of population: Population attributes - Population growth forms, Basic concepts of growth rates, density, natality, mortality, growth curves. Animal interactions: Positive – Commensalism – Mutualism - Protocooperation, Negative – Predation – Parasitism – Competition – Antibiosis. Characteristics of a community: Species diversity- richness, evenness, stratification, dominance, ecological indicators, Ecotone and Edge effect, Keystone species, Concepts of Ecological Niche And Guild, Ecological succession, community evolution- climax.

MODULE 3: BIODIVERSITY AND ENVIRONMENTAL ISSUES

16 Hrs

Introduction to Biodiversity: Types of biodiversity- Alpha, Beta and Gamma diversity. Concept and importance of Biodiversity: Levels of Biodiversity-Species diversity, Genetic diversity, Microbial, Ecosystem diversity, India as a mega-diversity nation, Biodiversity hotspots. Global Environmental Issues: Ozone depletion, Greenhouse effect, Global warming, Climate change, Carbon trading, carbon credit; Carbon sequestration, Acid rain, Oil spills, Nuclear accidents. IPCC/UNFCCC. National Environmental Issues: Deforestation, forest fire, pollution (air, water, soil, noise, thermal, nuclear - brief account only) solid waste management, sewage, drinking water crisis and water logging. Toxic products and disaster: Types of toxic substances – degradable, non-degradable, Impact on human – case studies: Endosulphan tragedy, Bhopal disaster. Flood, drought, cyclone, earthquake and landslide (Management and mitigation) Local Environmental issues: Landscape alteration, sand mining, quarrying, changing crop pattern, conversion of paddy lands. Threats to water resources of Kerala: Degrading Mangrove and wetland ecosystems of Kerala, Ramsar sites, Marine ecosystem crisis- pollution, overfishing etc. Impact of tourism on Environment.

MODULE 4: CONSERVATION OF BIODIVERSITY

12 Hrs

Protected area concept – Sanctuary, National Park, Biosphere reserve, Core Zone, Buffer Zone, Corridor concept. Conservation reserves Concept of threatened fauna – IUCN categories - extinct, extinct in the wild, critically endangered, endangered, and vulnerable, near threatened, least concern and data deficient. Red and Green Data Books. Man–animal conflict (Tiger, Elephant,

Dog, Monkey) – causes and concern Water conservation- rainwater harvesting, watershed management. Environment education Environmental laws (Brief account only): The Water (Prevention and Control of Pollution) Act, 1974, The Air (Prevention and Control of Pollution) Act, 1981, Indian Forests Act (Revised) 1982. The Environment (Protection) Act, 1986, Hazardous Wastes (Management and Handling) Rules, 1989, The Forest (Conservation) Act, 1980, the Wildlife Protection Act, 1972, Biodiversity Act, 2002.

MODULE 5: HUMAN RIGHTS

6 Hrs

Introduction, main concepts associated with Human Rights, Different types of human rights, Manifestations & phenomena, Role of agencies in promoting human rights, Mechanisms for checking violations of human rights, National human right commission, Constitutional provisions related to Human rights.

SEMESTER V

CORE COURSE

ZY5B06B18: CELL BIOLOGY AND GENETICS

Credits: 3

Total Lecture Hours: 54

CO1: Compare the structure and functions of the cell organelles

CO2: Explain Cell Communication and Cell Division.

CO3: Explain the basis of human genetics, inheritance, modes of gene interactions and different genetic disorder

CO4: Explain various strategies of sex determination and sex linked inheritance.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	2	1	2
CO2	3	1	2	1	2
CO3	3	1	2	1	2
CO4	3	1	2	1	2

Syllabus Contents

Module I CELL BIOLOGY

22 HRS

Introduction of cell and Diversity of cells: History, Cell theory, Prokaryotes, Eukaryotes, Mycoplasmas, Virus, Virions and Viroids, Prions. Cell membrane & Permeability: Molecular models of cell membrane (Sandwich model, Unit membrane model, Fluid mosaic model). Cell properties - permeability, Transport (Diffusion, Osmosis, Passive transport, Active transport, bulk transport), Cell coat and Cell recognition.

Module II

10 Hrs

Cell Organelles: Structure and functions of following cell organelles: Endoplasmic reticulum Structure and functions. Ribosomes (Prokaryotic and Eukaryotic), Golgi complex- Structure and functions. Lysosomes - Polymorphism - GERL concept, functions. Mitochondria - Structure and functions. Symbiont hypothesis. Nucleus: Structure and functions of interphase nucleus, Nuclear membrane, pore complex, structure and functions of nucleolus. Chromosomes – Structure & organization, Heterochromatin, Euchromatin, Nucleosomes, Polytene chromosomes-Balbiani rings, Endomitosis, Lamp brush chromosomes.

Module III

6Hrs

Cell Communication: Basic principles of cell communications, Cell signaling(in brief), Types of signaling, Mention signaling molecules (neurotransmitters, hormones, Growth Factors, Cytokines Vitamin A and D derivatives), Role of cyclic AMP Cell Division: Cell cycle - G1, S, G2 and M phases, Mitosis and Meiosis. The difference between Mitosis and Meiosis. Distinguish cell diversity

SEMESTER V

CORE COURSE

ZY5B07B18: EVOLUTION, ETHOLOGY & ZOOGEOGRAPHY

Credits – 3

Lecture Hours: 54

Course Outcomes:

CO1: Explain the evolutionary history of living and non-living world

CO2: Describe the concepts and theories related to evolution

CO3: Summarise the concepts of speciation, isolation and animal distribution

CO4: Illustrate types of learning, animal behaviour pattern and social organisation of animals

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	2	1	2
CO2	3	1	2	1	2
CO3	3	1	2	1	2
CO4	3	1	2	1	3

Syllabus Contents

PART I - EVOLUTION

30 Hrs

Module I - Origin of life

8 Hrs

Theories - Panspermia theory or Cosmozoic theory, Theory of spontaneous generation (Abiogenesis or Autogenesis), Special creation, Biogenesis, Endosymbiosis. Chemical evolution - Haldane and Oparin theory, Miller-Urey experiment. Direct evidences of evolution – Recapitulation Theory of Haeckel, Fossilization, Kinds of fossils, fossil dating, Homologous organs and analogous organs.

Module II - Theories of organic evolution

9 Hrs

Lamarckism and its Criticism, Weismann's Germplasm theory, Darwinism and its Criticism, Neo-Darwinism, Theory of DeVries. Population genetics and evolution: Hardy-Weinberg Equilibrium, gene pool, gene frequency. Factors that upset Hardy-Weinberg Equilibrium, Effects of genetic drift on population: Bottleneck effect and founder effect.

Module III – Nature of evolution

13 Hrs

Species and Speciation: Species concept, subdivisions of species (sub species, sibling species, cline and deme), Speciation: Types of speciation, Phyletic speciation (autogenous and allopathic transformations), True speciation, Instantaneous and gradual speciation, allopatric and sympatric speciation Isolation: Types of isolating mechanisms - Geographic isolation (mention examples) and Reproductive isolation. Role of isolating mechanisms in evolution Microevolution, Macroevolution (Adaptive radiation -Darwin finches) Mega evolution, Punctuated equilibrium, Geological time scale, and Mass extinction (brief account only). Evolution of Horse.

PART II – ETHOLOGY

14 Hrs

Module IV – Introduction, Learning, imprinting and behaviour

10 Hrs

Definition, History and scope of ethology Types of learning with examples; patterns of behaviors – types of rhythms, navigation, homing instinct, hibernation, aestivation; pheromones- types and their effect on behavior, hormones and their action on behavior (aggressive and parental behavior).

Module V – Social organization

4 Hrs

Social organization in insects (ants) and mammals (monkey), Courtship behavior and reproductive strategies.

PART III – ZOOGEOGRAPHY

10 Hrs

Module VI – General Topics

4 Hrs

Continental drift theory, Types and means of animal distribution, Factors affecting animal distribution; insular fauna – oceanic islands and continental islands.

Module VII – Zoogeographical realms

6 Hrs

Palearctic region, Nearctic region, Neotropical region, Ethiopian region, Oriental region, Australian region (brief account with physical features and fauna, Wallace's line, Weber's line, Biogeography of India with special reference to Western Ghats.

SEMESTER V

CORE COURSE

ZY5B08B18: HUMAN PHYSIOLOGY, BIOCHEMISTRY AND ENDOCRINOLOGY

Credits – 3

Lecture Hours: 54

Course Outcomes:

CO1: Differentiate the nutrient biochemistry, digestion, metabolism and nutritional disorders of Man.

CO2: Explain the structure, function, and disorders of the organ systems in man.

CO3: Classify the enzymes based on the chemical nature, mode of action and the factors influencing enzyme action.

CO4: Distinguish different endocrine glands, hormones and its role in homeostasis.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	2	1	2
CO2	3	1	2	1	3
CO3	3	1	2	1	2
CO4	3	1	2	1	3

Syllabus Contents

HUMAN PHYSIOLOGY

31 Hrs

Module I

8 Hrs

Nutrition

Nutritional requirements – carbohydrates, proteins, lipids, minerals (Ca, P, Fe, I), vitamins (sources and deficiency disorders). Importance of dietary fibre and antioxidants. Balanced diet,

Recommended Dietary Allowance (RDA). Nutrition during pregnancy and lactation, Infant nutrition, Malnutrition (PEM).

Digestion: Anatomy and histology of digestive glands (liver, pancreas, salivary, gastric and intestinal). Digestion and absorption of carbohydrates, proteins and fats. Nervous and hormonal control of digestion.

Module II

8 Hrs

Respiration: Phases of respiration (external respiration, gas transport and internal respiration). Respiratory pigments: Haemoglobin, Myoglobin (Structure and Function). Transport of respiratory gases - transport of oxygen, oxyhaemoglobin curve, factors affecting oxyhaemoglobin curve, Bohr Effect, transport of carbon dioxide, (chloride shift). Control of respiration. Respiratory disturbances (Hypoxia, Hypercapnia, Hypocapnia Asphyxia). Dysbarism, Oxygen toxicity, Physiological effect of smoking, carbon monoxide poisoning, Oxygen therapy and artificial respiration.

Circulation: Composition of Blood, (Brief account, self study) Haemopoiesis. Haemostasis (blood coagulation) – clotting factors, intrinsic and extrinsic pathways, anticoagulants and its mechanism of action. Cardiovascular diseases (Jaundice, Atherosclerosis, Myocardial infarction, Thrombus, Stroke). ESR, blood pressure, ECG, Angiogram and Angioplasty.

Module III

5 Hrs

Excretion: Histology of Bowman's capsule and tubular part. Urine formation – glomerular filtration, tubular reabsorption, tubular secretion. Urine concentration – counter current mechanism. Role of Kidney in Acid – base balance, hormonal regulation of kidney function. Renal disorders (kidney stone, acute and chronic renal failure, Nephritis, Nephrotic syndrome and dialysis). Homeostasis: Definition, Concept and importance in biological system. Thermal regulation and physiological adaptations to heat and cold in homeotherms.

Module IV 10 Hrs

Nerve physiology: Ultra structure of neuron. Nerve impulse production (resting membrane

potential, action potential), transmission of impulse along the nerve fiber, interneuron (synaptic transmission, neuromuscular junction and transmission of impulses. Neurotransmitters (acetyl choline, adrenalin, dopamine). EEG. Memory, Neural disorders (brief account on Dyslexia, Parkinson's disease, Alzheimer's disease, Epilepsy).

Muscle physiology: Ultra structure of striated muscle, muscle proteins (myosin, actin, tropomyosin, troponin), Muscle contraction and relaxation-Sliding Filament Theory, cross bridge cycle, biochemical changes and ATP production in muscle, Cori cycle. Kymograph, Simple muscle twitch, muscle fatigue, tetanus, rigor mortis.

BIOCHEMISTRY

15 Hrs

Module V

5 Hrs

Carbohydrates: Basic structure, biological importance and classification of monosaccharides, oligosaccharides and polysaccharides with examples.

Proteins: Basic structure and classification of amino acids; structure, biological importance and classification of proteins with examples.

Lipids: Structure of fatty acid, saturated and unsaturated fatty acid, biological importance and classification of lipids with examples.

Vitamins and minerals: Major fat soluble and water soluble vitamins. Important minerals and trace elements required for living organisms. Biological importance of vitamins and minerals.

Enzymes: Chemical nature of enzymes, mechanism of enzyme action, Factors influencing enzyme action (self study) enzyme activation, enzyme inhibition, allosteric enzymes, isoenzymes, co-enzymes. Michaelis–Menten enzyme kinetics.

Module VI

10 Hrs

Carbohydrate metabolism: Glycogenesis, Glycogenolysis, Gluconeogenesis, Hexose monophosphate Shunt, Glycolysis, Citric Acid Cycle, Electron Transport Chain and ATP synthesis. Ethanol metabolism.

Protein metabolism: Deamination, Transamination, Transmethylation, Decarboxylation, Ornithine cycle.

Lipid metabolism: Biosynthesis of fatty acids, Beta oxidation, physiologically important compounds synthesized from cholesterol.

Endocrinology and reproduction

8 Hrs

Module VII

8 Hrs

Endocrine physiology: Hormones – classification and mechanism of hormone action. Major endocrine glands (Histology is not included) their hormones, functions and disorders (hypothalamus, pituitary gland, pineal gland, thyroid gland, parathyroid gland, islets of Langerhans, adrenal gland, gonads, Placenta), Homeostasis and feedback mechanism.

SEMESTER V

OPEN COURSE (Offered for other streams)

ZY5D01aB18: HUMAN GENETICS, NUTRITION AND PUBLIC HEALTH

Credits – 3

Lecture Hours : 72

CO1: Differentiate the key concepts of health and effects of exercise on body systems.

CO2: Classify the nutrients, its balance and imbalances in man.

CO3: Apply the regular and alternative modes of life skills for the wellbeing of mind and body.

CO4: Explain public health diseases and sanitation measures.

CO5: Distinguish the genetic disorders and its diagnosis in man.

Syllabus Contents

PART I: HEALTH, EXERCISE & NUTRITION

Module 1- Definition and Meaning of Health 10 Hrs

Definition, Dimensions and Determination of Health. Physical Activity and Health benefits Effect of exercise on body systems – Circulatory, Respiratory, Endocrine, Skeletal and Muscular Programmes on Community health promotion (Individual, Family and Society) Dangers of alcoholic and drug abuse, medico-legal implications

Module 2- Nutrition and Health 10 Hrs

Concept of Food and Nutrition, Balanced diet. Vitamins, Malnutrition, Deficiency Disease Determining Caloric intake and expenditure. Obesity, causes and preventing measures Role of Diet and Exercise, BMI, BMR

Module 3- Safety Education in Health promotion 8 Hrs

Principles of Accident prevention Health and Safety in daily life, Health and Safety at work. First

aid and emergency care. Common injuries and their management. Modern life style and hypokinetic diseases. Diabetes, Cardiovascular disorders-Prevention and Management.

Module 4- Life Skill Education

8 Hrs

Life skills, emotional adjustment and well being. Yoga, Meditation and Relaxation, Psychoneuroimmunology

PART II: PUBLIC HEALTH AND SANITATION

Module 5 Public health and water quality

11 Hrs

Potable water, Health and Water quality, Faecal bacteriae and pathogenic microorganisms transmitted by water. Determination of sanitary quality of drinking water, water purification techniques.

Module 6 Public health and diseases

10 Hrs

Water borne diseases- Cholera and Typhoid. Prevention of Water borne diseases.

Food borne diseases and Prevention -Botulinum, Salmonellosis, Hepatitis A

Vector borne diseases & Control measures - Chikungunya, Filariasis and Dengu fever

Zoonotic disease-Leptospirosis & its control

Emerging diseases - Swine flu (H1N1), bird flu (H5N1), SARS, Anthrax

Re-emerging diseases –TB, Malaria

PART III: HUMAN GENETICS

Module 7 Human Genetics

10 Hrs

Human normal chromosome complement. Genetic disorders in man. Chromosomal anomalies. Eg. Down Syndrome and Cri du chat syndrome. Sex chromosomal anomalies – Syndromes- Klinefelters Syndrome and Turners Syndrome. Single gene mutation disorders- Eg. Sickle Cell anaemia. Polygenic – Cleft lip and palate. Sex linked inheritance – Haemophilia and Colour

blindness. Pre – natal Diagnosis (Amniocentesis, and Chorionic Villus Sampling) Ultra sound scanning and Fetoscopy Genetic Counselling. Eugenics and Euthenics.

Health Centre visit & Report Presentation

5 Hrs

SEMESTER V

OPEN COURSE (Offered for other streams)

ZY5D01bB18: VOCATIONAL ZOOLOGY

Credits – 3

Total Lecture Hours : 72

Course Outcomes

CO1: Differentiate the marine and freshwater fishes and their maintenance.

CO2: Distinguish the fish diseases and its feed formulations for commercial ornamental fish culture.

CO3: Explain the quail farming techniques and rearing equipments of honey bees.

CO4: Prepare a vermiculture unit for waste management.

Syllabus Contents

Module 1: Aquarium management

12 Hrs

General introduction to Aquarium, Aims and types of aquarium (material, size and shape), Requirements of an aquarium - filtration of waste, physical, chemical and biological; Setting an aquarium (self-sustainable with biological filters), Major indigenous aquarium fishes of Kerala.

Activity: Setting up of a freshwater aquarium and rearing of aquarium fishes.

Module 2: Ornamental Fish Culture

20 Hrs

Introduction to ornamental fishes: Present status of ornamental fish culture in India with special reference to Kerala, Breeding of Gold fish, Fighter, Gourami (*Osphroneus*), and Guppy (live bearer). Nutrition and types feed for aquarium fishes, Use of live fish feed organisms in Ornamental fish culture. Methods and techniques involved in the formulation of fish feed. Fish Transportation: Live fish packing and transport, Common diseases of aquarium fishes and their management. Establishment of commercial ornamental fish culture unit.

Activity: field visit to an ornamental fish breeding Centre to understand breeding practices of various aquarium fishes.

Module 3: Quail farming (*Coturnix coturnix*)

10 Hrs

Introduction, care of quail chicks, care of adult quails, care of breeding quails, ration for quail, care of hatching eggs, health care, use of quail egg and meat, Sources of quality chicks. Activity: Visit to a quail farm or viewing a quail documentary to familiarize the quail farming practices

Module 4: Vermiculture and composting

12 Hrs

Introduction, ecological classification of earth worms, Life history, Species of earth worms used for vermiculture, Preparation of vermibed; Preparation of vermicompost, Preparation of vermiwash, Maintenance and management of vermicomposting unit, Role of vermiculture in solid waste management.

Activity: - Preparation of a vermiculture unit or visit to a vermicomposting unit.

Module 5: Apiculture

18 Hrs

Definition, Uses of bees, species of bees cultured, organization of honey bee colony, bee keeping methods (modern method only) and equipments, management and maintenance of an apiary-growth period, dividing the colony, uniting two colonies, replacing old queen with new queen, honey flow period, Bee pasturage, Death period, Enemies of bees, Bee diseases, uses of honey and wax, Apitherapy, Propolis, Royal jelly, Agencies supporting apiculture.

Activity: Identify different types of honey bees and rearing equipments Field visit and report Submission

Field visit and report writing on any two items are taken for internal evaluation, instead of assignment and seminar. Conduct a workshop on various cultural practices and the preparation of byproducts.

SEMESTER V

OPEN COURSE (Offered for other streams)

ZY5D01cB18: MAN, NATURE AND SUSTAINABLE DEVELOPMENT

Credits – 3

Total Lecture Hours : 72

Course Outcomes:

CO1: Explain the different resources available on earth and the evolution of man and nature.

CO2: Discriminate global environmental problems, its impact on human wellbeing and summarize the concepts for Sustainable Development

CO3: Explain the perspectives of Man on nature.

CO4: Evaluate the global strategies for conservation of environment.

Syllabus Contents

Module I: Man in Nature

10 Hrs

Introduction. Evolution of Man

Out of Africa and Candelabra Model

The Fossils and the Molecular Evidences Hunter-Gatherer and the Agriculturist Speech and Languages. Cultural Evolution Altruism and Morality

Module II: The Biosphere

10 Hrs

Earth-Continents and Continental drift Freshwater

Concept of Landscapes and Habitats Lithosphere- Forest (Tropical and Temperate) Grasslands, Deserts and Montane

The Biomes of the World Hydrosphere- Oceans, Estuaries Water the Elixir of Life

Atmosphere- Structure and stratification

Module III: Dominance of Man on Earth

7 Hrs

Industrial Revolution-Human Population Growth Resource Utilization

Environmental Consequences Modern Agriculture and Green Revolution Environmental Impacts Imperialism and its Ecological Root

Module IV: Natural Resources

7 Hrs

Renewable and Non- renewable Biodiversity Importance of Biodiversity -the Six E S Hotspots of Biodiversity-Biotic Richness of India

Monoculture and loss of Genetic Diversity Extinction Crisis, IUCN and Red Data Book

Module V:

10 Hrs

Global Environmental Issues Threatening Natural Resources and Human Life

Deforestation,Landscape alterations, Soil erosion, Flood and Drought, Desertification, Overexploitation, Pollution (Air, Water and Soil- Pollutants and Consequences only), Acid rain, Ozone depletion, Greenhouse effect and Global Warming (use case studies to illustrate the points) Waste disposal (Biodegradable and Non-degradable eg. Plastic and E- waste), Oil spill Energy - Production, Consumption and its Impact on Environment Quality of the Environment and Human Health

Module VI: Man's Perspective on Nature

10 Hrs

Eco Spirituality, Eco-theology and Eco-feminism Community initiatives Indigenous People's Perspective (tribal and traditional communities)

Native American, Amazonian, Australian Aborigines, Bishnoi Contributions of -John Muir, Aldo Leopold, Thoreau, Rachel Carson Edward Abbey, Arne Ness, Carolyn Merchant,Vandana Shiva

Module VII: Global Strategies for Conservation

8 Hrs

UN conference on Man and Environment-1972 UNEP and its Contributions The World Conservation Strategy-1980

World Commission on Environment and Development The Earth Summit -1992 The UNFCC and IPCC-Conservation Strategies in India-MoEF

Legal System- Mention Major Conservation Acts People's Participation in Conservation: Chipko Movement and Narmada Bachao Andolan, Silent Valley

Module VIII: Sustainable Development

10 Hrs

Definition and Concept Principles and Goals-Environment versus Development Debate Johannesburg Conference -2002 Strategies for Sustainable development

Sustainable Development in the era of Globalization Gandhian Environmentalism Education for Sustainable Development (UNESCO-ESD) Building a Sustainable society Sustainable life styles

SEMESTER VI

Course Code	Course Title	Credits	Course Type
ZY6B09B18	Developmental Biology	3	Core Course
ZY6B10B18	Microbiology & Immunology	3	Core Course
ZY6B11B18	Biotechnology, Bioinformatics and Molecular Biology	3	Core Course
ZY6B12B18	Occupational Zoology (Apiculture, Vermiculture Sericulture & Aquaculture)	3	Core Course
ZY6B13aB18	Nutrition, Health & Life Style Management	3	Choice Based Core Course
ZY6B13bB18	Ecotourism & Sustainable Development	3	
ZY6B13cB18	Agricultural Pest Management	3	
ZY6BP03B18	Environmental Biology, Toxicology, Cell Biology & Genetics	2	Core Practical
ZY6BP04B18	Evolution, Ethology, Zoogeography, Human Physiology, Biochemistry & Endocrinology	2	Core Practical
ZY6BP05B18	Developmental Biology, Microbiology & Immunology	2	Core Practical
ZY6BP06B18	Biotechnology, Bioinformatics, Molecular Biology & Occupational Zoology	2	Core Practical
ZY6BPRB18	Project work & Field Visit/Study Tour, Visit to research institutes, Group activity	2	Project

SEMESTER VI

CORE COURSE

ZY6B09B18: DEVELOPMENTAL BIOLOGY

Credits – 3

Lecture Hours: 54

Course Outcomes:

CO 1: Explain the basic concepts and theories in Developmental Biology and Reproductive Physiology.

CO 2: Distinguish different developmental stages.

CO 3: Explain embryology of Frog, Chick and Man.

CO 4: Describe Experimental embryology, Teratogenesis and Developmental defects.

CO 5: Explain placenta, prenatal diagnosis and regeneration.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	2	1	2
CO2	3	1	2	1	2
CO3	3	1	2	1	2
CO4	3	1	2	1	2
CO5	3	1	2	1	2

Syllabus Contents

Module I

10 Hrs

Introduction: Definition, Scope of developmental biology, sub-divisions (descriptive, comparative, experimental and chemical), historical perspectives, basic concepts and theories. (Preformation and Epigenesis, Recapitulation theory or Biogenetic law, Germplasm theory (Weisman).

Reproductive Physiology: Gonads- anatomy of testis and ovary, spermatogenesis, oogenesis, gonadal hormones and their functions. Hormonal control of human reproduction - Female reproductive cycles (Estrous cycle, Menstrual cycle). Structure of mammalian sperm and egg, Reproductive health and importance of sex education.

Egg types: Classification of eggs based on the amount, distribution and position of yolk. Mosaic and regulative, cleidoic and noncleidoic eggs. Polarity and symmetry of egg.

Fertilization: Mechanism of fertilization-(Encounter of spermatozoa and Ova, Approach of the Spermatozoon to the Egg, Acrosome Reaction and Contact of Sperm and Ovum, Activation of Ovum, Migration of Pronuclei and Amphimixis,), Significance of fertilization, Polyspermy, Parthenogenesis- Different types and significance.(natural and artificial. Arrhenotoky, Thelytoky, Obligatory and Facultative)

Module II

14 Hrs

Cleavage: Types (Holoblastic (equal, unequal) and Meroblastic cleavage (discoidal and superficial), planes Meridional, Vertical, Equatorial, Latitudinal and patterns (Radial and Spiral, bilateral & rotational with examples) Determinate, Indeterminate cleavage, Cell lineage of Planocera. Influence of yolk on cleavage.

Blastulation: Morula, blastula formation, types of blastula (coeloblastula, stereoblastula, Discoblastula, Blastocyst) with examples.

Fate maps: Concept of fate maps, construction of fate maps (artificial and natural), structure of a typical chordate fate map. Significance of fate map.

Gastrulation: Definition Major events in gastrulation. Morphogenetic cell movements. (Epiboly, Emboly -invagination, involution, delamination, convergence, divergence infiltration) Influence of yolk on gastrulation. Exogastrulation. Concept of germ layers and derivatives (Brief account).

Cell differentiation and gene action: Potency of embryonic cells (Totipotency, Pleuripotency, Unipotency of embryonic cells). Determination and differentiation in embryonic development, Gene action during development with reference to Drosophila (Maternal effect genes, Zygotic genes).

Module III

20Hrs

Embryology of Frog: Gametes, fertilization, cleavage, blastulation, fatemap, gastrulation, neurulation, notogenesis. Differentaition of Mesoderm and Endoderm, Development of Eye and Brain. Metamorphosis of frog, Hormonal and environmental conrol.

Embryology of chick: Structure of egg, fertilization, cleavage, blastulation, fate map, gastrulation. Development and role of Primitive streak, Salient features of 18hour, 24 hour, 33 hour & 48 hour chick embryo. Extra embryonic membranes in chick.

Human development: Fertilisation, cleavage, blastocyst, implantation, placenta. Gestation, parturition and lactation. Human intervention in reproduction, contraception and birth control. Infertility, Invitro fertilisation (test tube baby)

Module IV

5Hrs

Experimental embryology: Spemann's constriction experiments, Organizers and embryonic induction. Embryo transfer technology, cloning, stem cell research. Ethical issues.

Teratology / Dysmorphology, Developmental defects: Teratogenesis, important teratogenic agents.(Radiations, chemicals and drugs, infectious diseases) genetic teratogenesis in human beings,

Developmental defects: Prenatal death (miscarriage and still birth). Intrauterine Growth Retardation (IUGR).

Module V

5 Hrs

General topics: Classification and functions of placenta in mammals. Prenatal diagnosis (Amniocentesis, Chorionic villi sampling, Ultra sound scanning, Foetoscopy, Maternal serum alpha-fetoprotein, Maternal serum beta-HCG).Regeneration in animals.

SEMESTER VI

CORE COURSE

ZY6B10B18: MICROBIOLOGY AND IMMUNOLOGY

Credits: 3

Total Lecture Hours: 54

Course outcomes

CO1: Differentiate various techniques of sterilization, media preparation and culture methods.

CO2: Summarize the fine structure, growth and reproduction of bacteria and viruses.

CO3: Explain the diseases caused by bacteria, virus and fungus.

CO4: Distinguish the applications of Antigen – antibody reactions.

CO5: Explain basic concepts of Immunology.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	2	1	2
CO2	3	1	2	1	2
CO3	3	1	2	1	2
CO4	3	1	2	2	2
CO5	3	1	2	2	2

Syllabus Contents

MICROBIOLOGY

Module I

10 Hrs

Introduction: History and scope of microbiology. Outline classification of Microbes.

Bacteria, Fungus & Virus)

Methods in Microbiology: Sterilization and disinfection - physical and chemical methods.

Culture media – selective media, enrichment media, differential media. Plating techniques and isolation of pure colony. Culture preservation techniques: Refrigeration, Deep freezing, Freezing under liquid nitrogen, lyophilization.

Module II

15 Hrs

Morphology and fine structure of bacteria: Size, shape, cilia, pili, flagella, capsule, cell wall and its composition. Cytoplasmic membrane, protoplast, spheroplast, intracellular membrane systems, cytoplasm, vacuoles, genetic material, cell inclusions, bacterial spores.

Bacterial growth Curve, Staining techniques – gram staining.

Bacterial Reproduction: Sexual – (conjugation, transduction) and Asexual (Fission, budding, fragmentation).

Virology: Structure of virus; Human, animal, and bacterial virus. Viral replication, cultivation of animal viruses.

Module III

8 Hrs

Infections & Diseases: Types of infections – primary, secondary and nosocomial infections. (Brief Account only) Contagious diseases – epidemic, endemic and pandemic, mode of Transmission – food, water, air, vectors and different types of carriers.

Diseases: Epidemiology, symptomology, diagnosis and treatment. Bacterial - Clostridium tetani (tetanus), Viral – HIV virus (AIDS), fungal –Candida albicans (candidiasis).

IMMUNOLOGY

Module IV

9Hrs

Introduction to Immunology: Innate and acquired immunity, passive (natural and artificial) and active immunity (Natural and Artificial).Mechanisms of innate immunity - barriers, inflammation, phagocytosis.

Lymphoid organs: Primary (Thymus, Bone marrow) and secondary lymphoid organs (lymph nodes, spleen).

Lymphocytes: T and B cells, Natural killer cells, memory cells, macrophages.

Module V

9 Hrs

Antigens, Types of antigens, haptens, adjuvants, immunoglobulin structure, classes and functions of immunoglobulins.

Types of Immunity- , humoral & cell mediated immunity Monoclonal & polyclonal antibodies

Antigen – antibody reactions, Precipitation test, Agglutination test, VDRL WIDAL, ELISA.

Auto immune diseases: Pernicious Anemia, Rheumatoid Arthritis. Immunodeficiency - AIDS.

Hypersensitivity- Type I, (E.g. Anaphylaxis) II (Transfusion reaction), III (Arthus reaction) and IV (Mantoux Test) (in brief).

Vaccines

3 Hrs

Introduction. Types of vaccines, Current Vaccines, Recent trends in vaccine preparation.

SEMESTER VI

CORE COURSE

ZY6B11B18: BIOTECHNOLOGY, BIOINFORMATICS AND MOLECULAR BIOLOGY

Credits : 3

Total Lecture Hours: 54

Course Outcomes

CO1: Explain the basic techniques and applications of biotechnology.

CO2: Summarize the basic bioinformatics and its applications in biology.

CO3: Describe the basic concepts in molecular biology.

CO4: Explain gene expression & gene regulation.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	2	2	3
CO2	3	1	2	2	2
CO3	3	1	2	2	2
CO4	3	1	2	1	1

Syllabus Contents

BIOTECHNOLOGY

20 Hrs

Module I

11 Hrs

Introduction: Scope, Brief History

Tools and Techniques in Biotechnology: Enzymes (restriction endonucleases, ligases, linkers & adapters), Vectors (Plasmids, Phage vectors, Cosmids, Artificial Chromosomes) Host cells. Basic steps & techniques in rDNA technology

Gene Libraries, Construction of genomic library and cDNA Library. PCR technique and DNA amplification, Brief description of screening methods – Probes, Nucleic Acid hybridization, In situ Hybridization, Fluorescence in situ Hybridization (FISH), Colony hybridization. Methods of transfer of desired gene into target cell. Blotting Techniques- Southern, Northern, Western blotting. DNA Finger printing (DNA Profiling) and its application. Molecular markers –RFLP.

Module II

9 Hrs

Animal Cell Culture: Brief account on methods, substrates, media and procedure of animal cell culture, Stem Cells, types and potential use, Organismal Cloning- reproductive & therapeutic- brief account only.

Applications of Biotechnology: Applications in Medicine (insulin, growth hormone, gene therapy), Agriculture (GM plants and biopesticides), Environment (bioremediation), Industry (Single Cell Protein) and applications of Fermentation Technology- lactic acid, vitamins, food and beverages.

Potential Hazards of Biotechnological Inventions: Risks related to genetically modified organisms (GMO) and biologically active products, Biological warfare & Biopiracy. Protection of biotechnological inventions. Intellectual Property Rights, Patenting and patent protection.

BIOINFORMATICS

14 Hrs

Module III

8 Hrs

Definition, Nature & Scope of Bioinformatics - Contrast between Bioinformatics and Computational Biology, Biological databases: Nucleotide sequence databases (NCBI- GENBANK, DDBJ and EMBL). Protein databases - structure and sequence databases (PDB, SWISSPROT and UNIPROT). Introduction to Sequence alignments: Local alignment and Global alignment, Pair wise alignment (BLAST and FASTA) and multiple sequence alignment. Basic ideas of Protein Structure prediction- Concept of Homology Modeling- Idea of Molecular Phylogenetics - Phylogenetic Tree construction and Analysis - advantages and computational

procedure (Brief description of Phylip).

Module IV

6 Hrs

Bioinformatics tools: (i) Molecular Visualization Software – Rasmol (Basic features only) – (ii) ORF finding (iii) Gene finding (iv) Hydrophobicity Prediction (v) Single Nucleotide Polymorphism (SNP) prediction using GENSNIIP. Basic concepts of Drug discovery pipe line, computer aided drug discovery and its applications. Human Genome Project and Human Brain Project (Brief account).

MOLECULAR BIOLOGY

20 Hrs

Module V

8 Hrs

Nature of Genetic Material: Discovery of DNA as genetic material – Griffith's transformation experiment. Avery MacCarty and Macleod, Hershey Chase Experiment of Bacteriophage infection, Prokaryotic genome; Eukaryotic genome. Structure and types of DNA & RNA. DNA replication. Modern concept of gene (Cistron, muton, recon, viral genes).

Brief account of the following - Split genes (introns and exons), Junk genes, Pseudogenes, Overlapping genes, Transposons.

Module VI

12 Hrs

Gene Expression: Central Dogma of molecular biology and central dogma reverse, one gene-one enzyme hypothesis, One gene - one polypeptide hypothesis Characteristics of genetic code, Contributions of Hargobind Khorana.

Protein synthesis (prokaryotic): Transcription of mRNA, Reverse transcription, post transcriptional modifications, Translation, Post translational modifications.

Gene regulation: Prokaryotic (inducible & repressible systems) Operon concept - Lac operon and Tryptophan operon, Brief account of Eukaryotic gene regulation.

SEMESTER VI

CORE COURSE

ZY6B12B18: OCCUPATIONAL ZOOLOGY

(APICULTURE, VERMICULTURE, SERICULTURE & AQUACULTURE)

Credits – 3

Total Lecture Hours: 54

Course Outcomes

CO1: Manage apiculture unit.

CO2: Establish a vermicomposting unit.

CO3: Explain basic concepts in Sericulture.

CO4: Prepare an aquaculture unit.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	3	2	2
CO2	3	1	2	2	2
CO3	3	1	2	2	2
CO4	3	1	2	2	2

Syllabus Contents

Module 1: APICULTURE

18 Hrs

Definition, Different species of honey bees, Organization of honey bee colony, Social life and adaptation of honey bees. Communication among honey bees. Bee keeping methods and equipments, Management and maintenance of an apiary, Growth period, honey flow period and dearth period. Division of the colony, uniting two colonies, replacing old queen with new queen, swarming management, monsoon management. Enemies of bees. Diseases of bees, Bee pasturage.

Uses of honey bees, By-products of honey bees, Honey and wax composition. Testing the quality of honey. Extraction of wax,. Uses of honey and wax. Royal jelly, Propolis, Apitherapy. Agencies supporting apiculture.

Activity: Visit to an apiculture unit.

Field visit and report submission - 10 Hrs

Field visit and report submission on any two items are taken for internal evaluation.

MODULE 2: VERMICULTURE

8 Hrs

Introduction, Ecological classification of earth worms. Species of earth worms used for vermiculture, Reproduction & life cycle, Role of earth worm in solid waste management, in agriculture, in medicine etc. Preparation of vermibed, Maintenance & monitoring, Preparation of vermicompost, Preparation of vermiwash.

Activity: Submission of a report after preparing a vermiculture unit or visiting a vermicomposting unit

MODULE 3: SERICULTURE

4 Hrs

Four species of silkworms, Life history of silkworms, Silkworm Rearing Techniques. Mounting of worms. Harvesting and stiffling of cocoons.

MODULE 4: AQUACULTURE

24 Hrs

Advantages and salient features of aquaculture, Types of Aquaculture, Biotic and abiotic features of water, Importance of algae in aquaculture, Common cultivable fishes of Kerala, Fish diseases, Composite fish culture, Integrated fish culture, Carp culture, Prawn culture Mussel culture Pearl culture. Processing & Preservation.

Aquarium management - Setting up of an aquarium, Biological filter & Aeration, Breeding of gold fish, gourami (*Osphronemus*), fighter and Guppy (live bearer). Nutrition and types of feed for aquarium fishes, Establishment of commercial ornamental fish culture unit. Fish Transportation - Live fish packing and transport Common diseases of aquarium fishes and their management. Aquaponics (a brief introduction only).

Activity – Setting up of an Aquarium Field visit – Visiting an Aquaculture farm.

SEMESTER VI

CHOICE BASED CORE COURSE (Elective I)

ZY6B13aB18: NUTRITION, HEALTH AND LIFESTYLE MANAGEMENT

Credits: 3

Total Lecture Hours: 72

Course Outcomes

CO1: Relate the principles of nutrition, food safety and their role in the health of man.

CO2: Differentiate the key concepts and parameters of health.

CO3: Distinguish the various lifestyle diseases and their causes.

CO4: Practice good lifestyle habits to maintain good health.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	1	2	2
CO2	3	1	1	2	2
CO3	3	1	1	2	2
CO4	3	1	1	2	2

Syllabus Contents

Module I NUTRITION

15 Hrs

Nutrition and health: Nutritional requirements of man, classification of major nutrients including protein, vitamins and minerals, water, role of fibre, biological value of food components, food groups and sources, balanced diet, RDA, BMI, BMR, Calorie intake and expenditure, Healthy eating pyramid, Nutrition in infancy, preschool, school, adolescent, pregnancy, lactation and old age. Nutrition in diseases and special conditions. Food safety: Nutrition education, food sanitation

and hygiene, food adulteration and consumer protection.

Module II HEALTH

18 Hrs

Understanding of health: Definition, Dimensions, and Determinants of Health, basic parameters of health care. (Health Parameters: Individual normal standards) & Devices. 1. Blood pressure, 2. Brain activities and sleep, 3. Focus or attention, 4. Pulse, 5. Body temperature, 6. Daily physical activities, 7. Electrocardiogram (ECG), 8. Cardiac fitness 9. Stress, 10. Haematological parameters.

Module III LIFESTYLE DISEASES

15 Hrs

a) Neural diseases: Depression, stroke and other neural disorders (brief account)
b) Cardio vascular diseases - including hypertension, Atherosclerosis and stroke, chronic obstructive pulmonary disease, asthma, Diabetes Mellitus or Type 2 Diabetes, C) kidney disorders and chronic renal failure, D) Intestinal diseases- constipation, gastro-intestinal disturbances including diarrhoea and peptic ulcer, E) Liver diseases- liver cirrhosis, F) Modern lifestyle disorders: sleeping habits- apnoea, junk food, poor eating habits, anxiety, food poisoning, cancer, obesity, osteoporosis, PCOD G) Occupational lifestyle diseases.

Module IV CAUSES OF LIFESTYLE DISEASES

10 Hrs

Defects of modern food habits and unbalanced diet options, food adulteration, environmental pollution, poor life style choices, drug abuse, alcohol and drug consumption, lack of adequate exercise, wrong body posture, disturbed biological clock, stressful environmental conditions.

Module V PREVENTION AND CONTROL OF LIFE STYLE DISEASES

14 Hrs

Healthy life style habits and practices, healthy eating habits, exercise and fitness, good sleep patterns, a strict no to alcohol, drugs, and other illegal drugs. Uncontrollable factors like age, gender, heredity and race.

Healthy diet: disease prevention through appropriate diet and nutrition, avoiding foods that are high in fats, salt and refined products. Avoid junk food and replace by natural food/ organic food. Physical exercise: Moderate exercise for fitness of body, walking, stretching, right postures of sitting & standing, relaxation and cutting down of stress, sports, aerobic exercise and yoga.

Physical Activity and Health benefits, Effect of exercise on body systems – Circulatory, Respiratory, Endocrine, Skeletal and Muscular

Health literacy as a public health goal: Awareness programs in schools, colleges and through mass media.

SEMESTER VI

CHOICE BASED CORE COURSE (Elective II)

ZY6B13bB18: ECOTOURISM & SUSTAINABLE DEVELOPMENT

Credits: 3

Total Lecture Hours: 72

Course Outcomes

CO1: Explain the key concepts and influencing factors of Tourism.

CO2: Identify the major areas of eco-tourism.

CO3: Distinguish the possible trends, problems and prospects of eco-tourism.

CO4: Discuss the need for sustainable and guided ecotourism

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	1	2	2
CO2	3	1	1	2	2
CO3	3	1	1	2	2
CO4	3	1	1	2	2

Syllabus Contents

Module I FUNDAMENTALS OF TOURISM

12 Hrs

Introduction- Tourism, concepts and definitions History, types, Characteristics

The facilitating sectors Attractions Geography, heritage Wildlife, nature Quality Control

Module II MAJOR AREAS OF ECO-TOURISM

10 Hrs

Concepts, practices and case studies for each: Marine tourism

Wildlife tourism Adventure tourism

Module III EMERGING TRENDS IN ECO-TOURISM **10Hrs**

Cultural tourism Pilgrimage tourism Farm tourism Backwater tourism Health tourism

Module IV PROBLEMS AND PROSPECTS OF ECO-TOURISM **10 Hrs**

Economics and benefits of ecotourism

Cultural issues and negative aspects of ecotourism Environmental Impacts of Tourism

Module V SUSTAINABLE TOURISM **12 Hrs**

Quality, Standards

Systems of sustainable tourism: environmental, sociocultural, Economical Environment and conservation: basic principles

Current practices of eco-conservation in tourism industry Sustainable tourism and society

Community based ecotourism

Eco-development committee (EDC) of Periyar Tiger Rerserve People initiatives.

Module VI ECO-TOURISM GUIDES **8 Hrs**

Ecotourism guiding and case studies

Activity

Field visit to Ecologically relevant places & Report writing **10 Hrs**

SEMESTER VI

CHOICE BASED CORE COURSE (Elective III)

ZY6B13cB18: AGRICULTURAL PEST MANAGEMENT

Credits: 3

Total Lecture Hours: 72

Course Outcomes

CO1: Explain the key concepts of agricultural practices and its pests.

CO2: Distinguish various agricultural pests and their host plants.

CO3: Identify different pest control practices.

CO4: Discuss on the major pests of crops and stored grains and their control.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	1	2	2
CO2	3	1	1	2	2
CO3	3	1	1	2	2
CO4	3	1	1	2	2

Syllabus Contents

Module I

5 Hrs

Pest and crop loss: Introduction, historical perspective-origin of pest, Evolution of pest. Causes of pest outbreak- biotic, abiotic and genetic factors. Modern agricultural practices and pest problem - high yielding varieties, monoculture, fertilizers, pesticides, irrigation, and cultural practices.

Module II

15 Hrs

Pest categories: Types of pests- insect pest and non-insect pest.

Insect pest: insect structure and function-external features (body parts), mouth parts of

phytophagous insects, internal anatomy, growth, development, reproduction, life cycle and metamorphosis (one example each from ametabolous, hemimetabolous and holometabolous insect), diapause. types of insect pests-key pests, occasional pests, potential pests.

Non insect pests: General features, different types – Rodents (mention the nature of crop loss by them) Mites-Main types of mites; plant injury caused by mite, millipedes and centipedes, slugs and snails (mention the damage of invasive Giant African Snail).

Activity: Identify a minimum of 5 invasive species (plant / animal) in your locality and make a report on their ecological impact.

Module III

7 Hrs

Pest and plants: Plant feeding insects-plant host range, types of injury, relationship of pest injury and yield.Host plant resistance: Characterization of resistance, mechanism of resistance (antixenosis, antibiosis, tolerance), biophysical, biochemical and genetic bases of resistance.

Module IV

20 Hrs

Pest control-principles and practices: Types of control-cultural control, biological control, chemical control, integrated pest management, miscellaneous control.

Cultural control: Water management, tillage, sanitation, plant diversity, crop rotation, planting time, harvesting practices etc

Biological control: Parasitoids and predators, control by insect pathogens. Techniques in biological control-conservation, introduction and augmentation. Biopesticides

Chemical control: Origin of chemical control, chemistry, mode of action and nomenclature (organochlorines, organophosphates, carbamates, synthetic pyrethroids, miscellaneous group) of pesticides, pesticide formulations and pesticide appliances (sprayers and dusters). Brief mention of attractants, repellents, chemosterilants and pheromones

Activity 1: Conduct a workshop on preparation of biopesticides of various types suitable for kitchen garden and agricultural fields.

Integrated Pest Management (IPM)

Miscellaneous control: Mechanical (hand picking, exclusion by screens and barriers, trapping, clipping, pruning etc), physical (hot and cold treatment, moisture, light traps etc), sterility

principle.

Module V

25 Hrs

Bionomics and control of major pests of crops and stored grains: Biology, life cycle and nature of damage by different pests of following crops and their control

Pests of paddy: *Leptocorisa acuta*, *Scirpophaga incertulas*, *Spodoptera mauritia*, *Orseolia oryzae*, *Nilaparvata lugens*

Pests of coconut: *Oryctes rhinoceros*, *Rhyncophorus ferrugineus*, *Opisina arenosella*, *Aceria guerreronis*

Pests of Banana: *Cosmopolites sordidus*, *Pentalonia nigronervosa*

Pests of vegetables -Brinjal: *Leucinodes orbonalis*, *Euzophera perticella*,

Henosepilachna nigritarbia, *Urentius hystricellus* Gourds -*Bactocera cucurbitae*, *Anadevidiapedon*, *Epilachna* spp. *Raphidopalpa foveicollis*, *Baristrichosanthus*

Pest of stored grains: *Sitophilus oryzae*, *Corcyra cephalonica* *Tribolium castaneum*, *Trogoderma granarium*, *Callosobruchus chinensis*

Activity 2: Conduct a poster exhibition on various types of pests of paddy, coconut, banana and vegetable varieties of Kerala.

Activity 3: Collect different types of pest of stored grains from the local provision shops or houses and make a taxonomic study and prepare a powerpoint presentation on them.

Activity 4: Visit a minimum of 5 kitchen gardens in the neighborhood and enlist the common traditional pest control measures used in them.

Activity 5: Organise awareness classes on the ill effects of chemical pesticides and manure on human health with the support of local examples.

SEMESTER VI

CHOICE BASED CORE COURSE (Elective IV)

ZY6B13dB18: VECTOR AND VECTOR BORNE DISEASES

Credits: 3

Total Lecture Hours: 72

Course Outcomes

CO1: Discuss on various insect vectors and their host characteristics.

CO2: Distinguish the major vector borne diseases.

CO3: Identify fundamentals of epidemiology.

CO4: Compare the disease-causing mosquitoes as a vector

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	1	2	2
CO2	3	1	1	2	2
CO3	3	1	1	2	2
CO4	3	1	1	2	2

Syllabus Contents

Module I

10 Hrs

Introduction: Vector: mechanical and biological vector, Reservoirs, Host-vector relationship, Vectorial capacity, Host Specificity.

Insect vectors: Mosquitoes, flies, fleas, lice, ticks and bugs- General account of ecology morphology and mouth parts.

Module II

6 Hrs

Salient features and distribution of mosquito species: Anopheles, Aedes, Culex, and Mansonia.

Module III

25 Hrs

Study of Vector Borne disease [Life cycle and pathology]: Mosquito-borne diseases – Malaria, Dengue, Chikungunya, Filariasis. Sand fly-borne diseases – Leishmaniasis, Phlebotomus fever. Tse- tse fly – sleeping sickness. House fly borne diseases: typhoid fever, cholera, dysentery, anthrax, Myiasis, Flea-borne diseases – Plague, Typhus fever. Louse- borne diseases –Relapsing fever, Trench fever, Vagabond's disease, Phthiriasis.

Module IV

13 Hrs

Introduction to Vector control: Aims, objectives and advantages. History and background, recent trends, alternatives to the use of insecticides (chemical & microbial), types of vector control - selective, integrated and comprehensive vector control.

Control measures of mosquitoes, sand fly, tsetse fly and domestic flies

Module V

8 Hrs

Introduction to epidemiology: History, Definition, scope and uses of epidemiology. Epidemiology and public health. Achievements in epidemiology: Smallpox Methyl mercury poisoning. Rheumatic fever and rheumatic heart disease Iodine deficiency diseases Tobacco use, asbestos and lung cancer, Hip fractures. HIV/AIDS, SARS.

Field report on two case studies of epidemiology in India.

10 Hrs

SEMESTER VI

CORE PRACTICAL

ZY6BP03B18: ENVIRONMENTAL BIOLOGY, TOXICOLOGY, CELL BIOLOGY & GENETICS

Credits –2

No. of Hours: 36

Course outcomes

CO1: Administer experiments in Environmental Biology and Cell Biology.

CO2: Survey important biodiversity areas.

CO3: Solve the problems in Genetics.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	3	1	2
CO2	3	1	3	1	2
CO2	3	3	3	1	2

Syllabus Contents

ENVIRONMENTAL BIOLOGY AND TOXICOLOGY

1. Estimation of dissolved oxygen.
 2. Estimation of carbon dioxide.
 3. Estimation of soil organic carbon (Demonstration only).
 4. Identification of marine/ fresh water planktons.
 5. Counting of plankton using plankton counting chamber
 6. Study of equipments - Secchi disc, Plankton net.
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7. Study of sandy shore fauna and rocky shore fauna.
 8. Study of animal associations.
 9. Visit to any two important areas of bio diversity:
 1. Forest, 2. Sea shore, 3. Mangrove, 4. Wet lands, 5. Bird sanctuary, 6. Wild life sanctuary, 7. Sacred groves Field study (compulsory)

CELL BIOLOGY

1. Squash preparation of onion root tip for mitotic stages.
2. Mounting of polytene chromosome (Drosophila/Chironomous) Demonstration
3. Tissues (permanent slides of epithelial tissues, striated muscle, smooth muscle, cartilage, bone)
4. Identification of cell organelles
5. Preparation of temporary whole mount.
6. Preparation of permanent whole mount (demonstration)
7. Preparation of human blood smear and identification of Leucocytes

GENETICS

1. Genetic problems on Monohybrid, Dihybrid Crosses and Blood group inheritance
2. Study of normal male and female human karyotype (use photographs or Xerox copies)
3. Abnormal human karyotypes - Down, Edwards, Klinefelter and Turner syndromes (use photographs or Xerox copies).
4. Sexing of Drosophila.
5. Study of Barr body in human buccal epithelium.

SEMESTER VI

CORE PRACTICAL

**ZY6BP03B18: EVOLUTION, ETHOLOGY, ZOOGEOGRAPHY, HUMAN
PHYSIOLOGY, BIOCHEMISTRY & ENDOCRINOLOGY**

Credits –2

No. of Hours: 36

Course outcomes

CO1: Illustrate the concepts in Evolution, Ethology and Zoogeography.

CO2: Administer experiments in Physiology, Biochemistry and Endocrinology.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	3	2	2
CO2	3	1	3	2	2

Syllabus Contents

EVOLUTION, ETHOLOGY AND ZOOGEOGRAPHY

1. Identification of Zoogeographical realms using map.
 2. Study on endemic species of each realm.
 3. Show the discontinuous distribution of lung fishes, camel, elephant.
 4. Providing a map trace the route of HMS Beagle.
 5. Providing a map mark any two continental/oceanic islands: Greenland, Madagascar, New Zealand, New Guinea, Maldives, Iceland, Hawaii – Any two.
 6. Contributions of scientists (showing photos) – Any four.
 7. Identification of different stages of horse evolution.
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8. Study on Homology and Analogy.
 9. Study on connecting links (Peripatus, Archaeopteryx, Protopterus, Echidna)
 10. Pheromone traps, Skinner box & T-maze
 11. Experiment to demonstrate phototaxis and chemotaxis using *Drosophila*/ Housefly
 12. Identification of behaviour (Grooming/ courtship dance of flamingos/ stickle backfish/ Tail wagging dance/ Aggressive behaviour/ Auto/ Allo grooming, Flehmen response) showing pictures (Any five)

HUMAN PHYSIOLOGY, BIOCHEMISTRY & ENDOCRINOLOGY

A. HUMAN PHYSIOLOGY

- 1). Determination of haemoglobin content of blood.
- 2). Total RBC count using Haemocytometer.
- 3). Total WBC count using Haemocytometer .
- 4). Estimation of microhaematocrit.
- 5). Effect of hypertonic, hypotonic and isotonic solutions on the diameter of RBC.
- 6). Instruments: Kymograph, Sphygmomanometer and Stethoscope (principle and use).
- 7). Measurement of blood pressure using sphygmomanometer (demonstration only).

B. BIOCHEMISTRY

1. Qualitative analysis of protein, glucose, starch and lipids.
2. Chromatography – Determination of R_f value of amino acids and identification of amino acids (Identify the Amino Acids using different solvent front and solute front – Demonstration)

C. ENDOCRINOLOGY

1. Cockroach – Corpora cardiaca & Corpora allata (Demonstration)
2. Effect of adrenalin on heart beat of Cockroach (Demonstration)

SEMESTER VI

CORE PRACTICAL

**ZY6BP05B18: DEVELOPMENTAL BIOLOGY, MICROBIOLOGY &
IMMUNOLOGY**

Credits –2

No. of Hours: 36

Course outcomes

CO1: Administer experiments in Developmental Biology, Microbiology and immunology.

CO2: Dissect and display male and female reproductive organs in Fish

CO3: Calculate fecundity and gonado-somatic index of fish.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	3	2	2
CO2	3	3	3	2	2
CO3	3	1	3	2	2

Syllabus Contents

DEVELOPMENTAL BIOLOGY

Model/Chart/ Slide may be used

1. Embryological studies- Blastula (frog, chick)
2. Embryo transfer, cloning, gastrula (frog, chick)
3. Amniocentesis
4. Embryo transfer technology, cloning
5. Study of placenta- pig and man

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6. 18 hour, 24 hour, 33 hour and 48 hour chick embryo.
 7. Candling method.
 8. Vital staining-demonstration.
 9. Male and female reproductive organs in Fish/ Cockroach.
 10. Calculate the fecundity of fish.
 11. Calculate the gonado-somatic index of given fish.

MICROBIOLOGY & IMMUNOLOGY

1. Instruments –Autoclave, Hot air oven, Bacteriological incubator – Laminar air flow
2. Preparation of solid and liquid media for microbial cultures. (Ingredients, pH and method of preparation) (Demonstration).
 - (a) Solid media (1) Nutrient agar (2) Mac Conkey's agar
 - (b) Liquid Media (1) Nutrient broth (2) Peptone water.
3. Culture methods (Demonstration)
 - (a) Streak plate technique and isolation of pure colonies.
 - (b) Lawn culture
 - (c) Pour plate culture
 - (d) Liquid culture
4. Examination of microbes in living condition: Hanging drop method for demonstrating motility of bacteria.
5. Gram staining – preparation, procedure, identification of Gram + ve and Gram –ve bacteria.
6. Antibiotic sensitivity test (demonstration only).
7. Streak plating (individual performance).
8. Preparation of a fungal smear – Lactophenol cotton blue staining and mounting.
9. Determination of ABO blood groups and Rh factor (Antigen – antibody Reaction).
10. Study through photographs/ illustration, the primary immune (Bone marrow and thymus) and secondary immune (spleen and lymph nodes) organs in Rat/Man.

SEMESTER VI

CORE PRACTICAL

**ZY6BP06B18: BIOTECHNOLOGY, BIOINFORMATICS, MOLECULAR BIOLOGY &
OCCUPATIONAL ZOOLOGY**

Credits –2

No. of Hours: 36

Course outcomes

CO1: Describe biomolecules & biological techniques

CO2: Explain the basics in bioinformatics

CO3: Illustrate the skill in animal rearing

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	3	1	2
CO2	3	1	3	1	2
CO3	3	1	3	1	2

Syllabus Contents

BIOTECHNOLOGY, BIOINFORMATICS AND MOLECULAR BIOLOGY

BIOTECHNOLOGY

1. Identify and comment on the item provided: (Western blotting / Southern blotting / Northern blotting / PCR).
2. Write down the procedure involved in DNA isolation.

BIOINFORMATICS

1. Download/ use print out/ pictures of genome sequences of any 2 organisms. Identify and mention the characteristic features of both.

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2. Download/ use print out/ pictures of a protein sequence, identify it & comment on its amino acid composition
 3. Download / use print out/ pictures of a macromolecule. Write a brief note on the bioinformatics tool used to visualize its structure.

MOLECULAR BIOLOGY

1. Identify and comment on the molecular composition / structural orientation / functional significance (Any tissue / Cell organelles/ DNA, DNA replication, RNA different types) using models or diagrams.

OCCUPATIONAL ZOOLOGY

1. General Identification, Economic importance, Morphology, scientific names and common names of the following
 - a) Economic important and morphology of culturable fishes (Catla, Rohu, Grass carp, Common carp, Silver carp, *Etroplus suratensis*, *Oreochromis* /Tilapia, *Mugil cephalus* and *Anabas testudineus*)
 - b) Identification and morphology of ornamental fishes (gold fish, fighter, Gourami, Angel fish, Guppy.
 - c) Two species of earthworms used in Vermiculture.
 - d) Four species of honey bees.
 - e) Economic importance and morphology of shell fishes (Any three species of prawn, two marine mussels, two oysters: one rock oyster - *Crassostrea* and pearl oyster - *Pinctada fucata* and freshwater mussel - *Lamellidens marginalis*).
 1. Castes of bees.
 2. Principle& uses of - Aquarium filters, Aquarium aerator, Aquarium plants, Oven, Pelletiser, Screw Press, die plate.
 3. Identification and study of fish parasites and diseases (five numbers each) using slides/ pictures.
 4. Bee keeping equipments, Beehive, Smoker, honey extractor, Queen Cage.
 5. Bees wax, Honey, Vermicompost (Identification-Uses).
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6. Formulation of artificial feed for aquarium fishes – demonstration
 7. Tests for determining the adulteration in honey.
 8. Mounting of pollen basket.
 9. Mounting of mouth parts of honey bee.
 10. Separation of cocoon from worm castings.
 11. Silkworm. Cocoon/Adult.
 12. Chandrika /Natrika used in sericulture.

SEMESTER VI

CORE PROJECT

ZY6BPRB18 - Project work & Field Visit/Study Tour, Visit to research institutes, Group activity

Credit: 1

Course outcomes

CO1: Explain the places of zoological importance.

CO2: Manage group activity.

CO3: Write project report.

Mapping of Course Outcomes with Program Specific Outcomes

Mapping	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	2	2	3
CO2	3	1	2	1	3
CO3	3	2	2	1	3

Syllabus Contents

FIELD STUDY/ (STUDY TOUR)

Study tour/Field study, visit to research institute and various places of zoological importance. A study tour is compulsory. Field study/ study tour should be conducted for not less than four days (completed during the entire programme), preferably spreading the study in the first to sixth semesters). Students are expected to visit research institutes and various places of zoological importance.

GROUP ACTIVITY

Students are expected to do one group activity in the fifth semester and submit the report in the sixth semester for external practical examination along with study tour report. A maximum of ten students can choose any one group activity like aquarium management, vermicomposting, bee keeping and conduct of zoological exhibitions, designing of posters of zoological importance, surveys related to disease outbreaks, community health programmes or any matter of zoological interest.

PROJECT

Students are free to choose any Research Topic related with courses of Zoology programme for their investigatory project work in consultation with their supervising teacher.