



MANONMANIAM SUNDARANAR UNIVERISTY,  
TIRUNELVELI-12

## SYLLABUS

### UG - COURSES – AFFILIATED COLLEGES

Course Structure for B. Sc. Zoology  
(Choice Based Credit System)

(with effect from the academic year 2024-2025 onwards )



| Semester-IV |                   |   |                              |        |
|-------------|-------------------|---|------------------------------|--------|
| Part        | Subject Status    | Subject Title   | Subject Code                 | Credit |
| I           | LANGUAGE          | TAMIL/MALAYALAM/HINDI   | F1TL41/<br>F1MY41/<br>F1HD41 | 3      |
| II          | ENGLISH           | ENGLISH   | F2EN41                       | 3      |
| III         | CORE              | GENETICS AND EVOLUTION  | FCZO41                       | 4      |
| III         | CORE              | LAB ON GENETICS AND<br>EVOLUTION ELECTIVE-IV                          | FCZOP4                       | 2      |
| III         | ELECTIVE          | ALLIED CHEMISTRY FOR<br>BIOLOGICAL SCIENCES - II                      | FECH42                       | 3      |
|             |                   | PRACTICAL: SYSTEMATIC<br>ANALYSIS OF ORGANIC<br>COMPOUNDS.            | FECHP4                       | 2      |
| IV          | SEC 5             | BASICS OF MARINE BIOLOGY /<br>WILDLIFE CONSERVATION AND<br>MANAGEMENT | FSZO41/<br>FSZO42            | 1      |
| IV          |                   | VALUE BASED EDUCATION   | FVBE41                       | 2      |
| IV          | NAAN<br>MUDHALVAN | BASIC COURSE IN<br>ORNITHOLOGY  |                              | 2      |



**Total Marks: 100 Internal Exam: 25 marks + External Exam: 75 marks**

**A. Scheme for internal Assessment:**

Maximum marks for written test: **20 marks**

**3 internal tests**, each of **I hour** duration shall be conducted every semester.

To the average of the **best two** written examinations must be added the marks scored in. The **assignment** for 5 marks.

The break up for internal assessment shall be:

Written test- 20 marks; Assignment -5 marks Total - 25 marks

**B. Scheme of External Examination**

**3 hrs.** examination at the end of the semester

A – Part : 1 mark question two - from each unit

B – Part : 5 marks question one - from each unit

C – Part : 8 marks question one - from each unit

➤ **Conversion of Marks into Grade Points and Letter Grades**

| S.No | Marks  | Letter Grade | Grade point (GP) | Performance   |
|------|--------|--------------|------------------|---------------|
| 1    | 90-100 | O            | 10               | Outstanding   |
| 2    | 80-89  | A+           | 9                | Excellent     |
| 3    | 70-79  | A            | 8                | Very Good     |
| 4    | 60-69  | B+           | 7                | Good          |
| 5    | 50-59  | B            | 6                | Above Average |
| 6    | 40-49  | C            | 5                | Pass          |
| 7    | 0-39   | RA           | -                | Reappear      |
| 8    | 0      | AA           | -                | Absent        |

➤ **Cumulative Grade Point Average (CGPA)**

$$CGPA = \frac{\Sigma (GP \times C)}{\Sigma C}$$

- **GP** = Grade point, **C** = Credit
- CGPA is calculated only for Part-III courses
- CGPA for a semester is awarded on cumulative basis

➤ **Classification**

- First Class with Distinction : CGPA  $\geq$  7.5\*
- First Class : CGPA  $\geq$  6.0
- Second Class : CGPA  $\geq$  5.0 and  $<$  6.0
- Third Class : CGPA  $<$  5.0



## Part 1 TAMIL

# பொதுத்தமிழ் 4 - தமிழும் அறிவியலும்

**அலகு 1: தமிழரின் அறிவியல் சிந்தனைகள்**

1. அறிவியலும் மனித வாழ்வும்
2. ஐந்திணைப் பகுப்பும் சூழலியலும்
3. தொழில்நுட்ப மேலாண்மை
4. நேர் நிலம் மேலாண்மை

**அலகு 2: பழந்தமிழ் இலக்கியங்களில் அறிவியல் சிந்தனைகள்**

1. நிலவியல்
2. உலோகவியல்
3. வானவியல்
4. உயிரியல்
5. உளவியல்

**அலகு 3: இடைக்கால இலக்கியங்களில் அறிவியல் சிந்தனைகள்**

1. காப்பியங்களில் அறிவியல்
2. சிற்றிலக்கியங்களில் அறிவியல்
3. உரைநூல்களில் அறிவியல்

**அலகு 4: இணையத் தமிழ்**

1. இணையத் தமிழ் பயன்பாடு - அறிமுகம்
2. இணையத் தமிழ் கல்விக்கழகம்
3. இணைய நூலகம்
4. செயற்கை நுண்ணறிவியல்
5. தமிழ்நாட்டு அறிவியல் ஆளுமைகள்

**அலகு 5: கடிதம் எழுதுதலும் கட்டுரை எழுதுதலும்**

1. உறவு முறைக் கடிதப் பயிற்சி
2. அலுவலகக் கடிதப் பயிற்சி
3. விண்ணப்பப் படிவம் எழுதும் பயிற்சி
4. தன் விவரப் படிவம் எழுதும் பயிற்சி
5. கருத்து விளக்கக் கட்டுரைகள் எழுதும் பயிற்சி
6. பத்திரிகைகளுக்குக் கட்டுரை எழுதும் பயிற்சி

### Text Books;

1. அறிவியல் தமிழ் இன்றைய நிலை - இராதா செல்லப்பன், உலகத் தமிழாராய்ச்சி நிறுவனம், சென்னை
2. மாணவ முஸ்தபா. தமிழில் அறிவியல் படைப்பிலக்கியம், மணவை பூப்பிளிகேஷன், சென்னை.
3. கலைச்சொல்லாக்கம் - மங்கை, ரங்கராசபுரம், சென்னை

### Reference Books:

1. தமிழர் மேலாண்மை மரபுகள் - இல). செ. கந்தசாமி
2. சங்க இலக்கியத்தில் வேளாண் சமுதாயம், பொ. மாதையன், நியூ செஞ்சுரி புக் ஹவுஸ்

### Websites:

1. <https://www.chennaiLibrary.com/>
2. [முகப்பு - சிறுகதைகள்](#)
3. [www.tamilvirtualuniversity.org](http://www.tamilvirtualuniversity.org)
4. [Buy tamil books online 10% to 50% discount, Tamil Novels, Tamil Audio Books online – Buy tamil books online – Established 2010](#)
5. [www.katuraitamilblogspot.com](http://www.katuraitamilblogspot.com)



# Part I MALAYALAM

## DESKTOP PUBLISHING AND PRINTING IN MALAYALAM

### UNIT I

This unit introduces basics of the printing technology, History of Malayalam printing-publishing-Newspapers-Journals-Social commitment -Propagation of ideas- Social struggle against invasion product of industrialization-printing in new era- - Data entry, DTP, editing, layout and Book publishing, e-publishing -: Significance of ISBN and ISSN..

### UNIT II e -Malayalam – Malayalam in cyber space Detailed Study :

1. Malayalam computing-charithravalokanam.Dr.Mahesh Mangalatt ,Cyber Malayalam Sunitha T.V.(Ed)
2. Vayana, Ezhuthu, prasadhanam digital yugathil Dr.B.Iqbal(Grandhalokam- June 2013)

### UNIT III e-Vayana- Reading in digital era Detailed Study :

1. E.vayana innathe Vayana– E-malayalam.Sunitha T.V State Institute of Languages.Thiruvananthapuram
2. Malayalam wiki media samrambhanga.Shiju Alex Cyber Malayalam .Sunitha T.V (Ed).Current Books.
3. Web magazinukal-Ini Vayana E Vayana.V.K Adarsh D C Books

### UNIT IV Modern Media

Tools in Cyber space-editing tools

Unicode- Fonts- Drawing Tools, Painting tools. M S Paint- File Types (jpg ,IMG, XMP, Gif, PNG)

Resolution-Layers-Palattes, Greyscale, image, image recognition, Colour space, image transformation- image preview.

Detailed Study:

Unicode – Ini vayana e vayana – V.K Adarsh - D C Books

### UNIT V

Proof reading techniques and cataloguing, cover designing, blurb writing

Detailed study:

Proof thiruthal.Vaniyaparamaya kathidapadukal.G.R.Pilla,  
State Institute of Languages.Thiruvananthapuram

### Reading List (Print and Online )

1. <https://www.amazon.com/Desktop-publishing-Bittukumar/dp/9350570130>
2. Computer parichayavum prayogavum.Dr.Achytsankar S Nair State Institute of languages.Thiruvananthapuram
3. Malayalam computing parimithikalum sadhyathakalum (Combled.) Dr.Smitha K Nair
4. Sankethika patham-kerala University Publications
5. Computer Gurukulam-DTP ,Kairali Publications Thiruvananthapuram
6. Pusthaka nirmaanam - The state Institute of languages, Thiruvananthapuram
7. Proof reading - The state Institute of languages
8. Printing A to Z - K.J. Sam kutti
9. Ini vayana e vayana- V.K. Adarsh, D.C. books.
10. IPrinting Technology and Compositing- The State institute of Language s . T Thiruvananthapuram
11. Navamadhyamangal Bhaasha sahiyam samskaram- Jose K Manuel, N B S
12. Cyber aadhunikata @ Malayalam – Jose K Manuel ,Athma Books
13. Bookstalgia- P.K. Rajasekharan- Mathrubhumi books
14. Pusthakam Untakunnathu- V.K. Haridas, Poorna publications, Kozhikode
15. An Introduction to Book Publishing D,Raghavan
16. Copy Editing- Judith Butcher
17. E Malayalam –Sunitha T.V- The State Institute of Language s



# PART I HINDI

## Hindi Bhasha aur Computer

### Course Objectives

The Main Objectives of this course are to:

- Knowing about computer in Hindi
- Understanding Technical Hindi
- E-Learning and its aspects
- Hindi application with the Technical tools

### Unit I

Computer aur Hindi

- Computer ka Parchay aur Vikas
- Computer mein Hindi ke Vividh Prayog

### Unit II

Proudyogiki aur Hindi

- Unicode
- Dewanagari Lipi
- Hindi ki Vibhinna Website – Ek Parichay

### Unit III

Computer ke madhyam se Hindi shikshan

- Vibhinna Shikshan Takkini ki
- Sarkari aur gair sarkari sansthaon mein prayukt Hindi Bhasha

### Unit IV

Vividh Paksh

- Internet par Hindi Bhasha
- Hindi SMS
- Hindi Tankan
- Hindi ke Vibhinna Prayukthi

### Unit V

Pratiyogi priksa par aadharit Computer sambandhit prashikshan Karya

- Hindi mein Powerpoint banana
- Hindi mein Google Document taiyar karna
- Hindi mein Google form taiyar karna
- Vibhinna pratiyogi parikshao ke bare mein suchna pradan karna

### Reference Books

1. Social Networking: Naye Samay ka Samvad – Ed. Sanjay Dwivedi
2. Jansanchar aur Maas Culture – Jagdeeshwar
3. Media: Bhumandalikaran aur Samaj – Ed. Sanjay Dwivedi
4. Naye Jamane ki Patrakarita – Sourabh Shukla
5. Patrakarita se Media tak – Manoj Kumar

### Related Online Contents (MOOCs, SWAYAM, NPTEL, YouTube, Websites, etc.)

1. <https://techshindi.com/%E0%A4%AB%E0%A4%BC%E0%A5%89%E0%A4%A8%E0%A5%8D%E0%A4%9F%E0%A4%95%E0%A5%8D%E0%A4%AF%E0%A4%BE-%E0%A4%B9%E0%A5%88%E0%A4%82-%E0%A4%94%E0%A4%B0-%E0%A4%AF%E0%A5%87-%E0%A4%95%E0%A4%BF%E0%A4%A4%E0%A4%A8/>
2. <https://www.techyukti.com/2020/12/computer-font-kya-hai.html>
3. <https://chti.rajbhasha.gov.in/pdf/Chap4HindiShabadSansadhan2ndEditionPart2.pdf>



## Part II ENGLISH

### UNIT I GOAL SETTING (UNICEF)

#### Life Story

- 1.1 From Chinese Cinderella – Adeline Yen Mah
- 1.2 Why I Write - George Orwell

#### Short Essay

- 1.3 On Personal Mastery – Robin Sharma
- 1.4 On the Love of Life – William Hazlitt

### UNIT II INTEGRITY

#### Short Story

- 2.1 The Taxi Driver – K.S. Duggal
- 2.2 Kabuliwala - Rabindranath Tagore
- 2.3 A Retrieved Reformation – O Henry

#### Extract from a play

- 2.4 The Quality of Mercy (Trial Scene from the Merchant of Venice - Shakespeare)

### UNIT III COPING WITH EMOTIONS

#### Poem

- 3.1 Pride – Dahlia Ravikovitch
- 3.2 Phenomenal Woman – Maya Angelou

#### Reader's Theatre

- 3.3 The Giant's Wife A Tall Tale of Ireland –William Carleton
- 3.4 The Princess and the God : A Tale of Ancient India

### UNIT IV Language Competency Sentences

- 4.1 Simple Sentences
- 4.2 Compound Sentences
- 4.3 Complex Sentences

#### Direct and Indirect Speech

### UNIT V Report Writing

- 5.1 Narrative Report
- 5.2 Newspaper Report

#### Drafting Speeches

- 5.3 Welcome Address
- 5.4 Vote of Thanks

#### Text Books (Latest Editions)

1. Oxford Practice Grammar , John Eastwood, Oxford University Press
2. Cambridge Grammar of English , Ronald Carter and Michael McCarthy
3. George Orwell Essays, Penguin Classics

#### Web Resources

1. <http://www.gradesaver.com/George-orwell-essays/study/summary>
2. O' Henry. A Retrieved Reformation.  
[https://americanenglish.state.gov/files/ae/resource\\_files/a-retrieved-reformation.pdf](https://americanenglish.state.gov/files/ae/resource_files/a-retrieved-reformation.pdf)
3. Maya Angelou. Phenomenal Woman.  
<https://www.poetryfoundation.org/poems/48985/phenomenal-woman>
4. The Quality of Mercy, <https://poemanalysis.com>
5. [https://www.oxfordscholarlyeditions.com/display/10.1093/actrade/9780199235742.book.1/acrade-9780199235742-div1-106-William\\_Hazlitt](https://www.oxfordscholarlyeditions.com/display/10.1093/actrade/9780199235742.book.1/acrade-9780199235742-div1-106-William_Hazlitt)



# GENETICS AND EVOLUTION

## Course Objectives

- To understand inheritance patterns and the principles of heredity, modification and extensions of Mendel's basic principles and role of genetics in biology.
- To know the causes and effects of genetic variation and to gain Knowledge in linkage & recombination (crossing over) and chromosomal mutations.
- To Understand 'DNA' as the basic genetic material and regulation of gene expression.
- Interpret that the evolution process depends on genetic variation and know the major events in evolution..
- To perceive the micro evolutionary concepts and principle of macroevolution.

## UNIT I

Mendel and his experiments - Monohybrid and dihybrid cross -Laws of inheritance- Mendelian traits in Man- Non-Allelic gene interaction: Complete, incomplete and codominance- Allelic Gene interaction: Complementary genes, Lethal genes and Epistasis. Multiple Alleles: ABO Blood Group – Rh Blood group. Polygenic inheritance: Skin colour of Man. Sex determination in man and genic balance theory. Cytoplasmic inheritance: Kappa particles in paramecium- Genetic maternal effect in shell coiling of Limnaea.

## UNIT II

Linkage- Morgan's experiment, complete & incomplete linkage- Crossing over - types, mechanisms- chromosome mapping- interference and coincidence. Karyotype. Sex Linked Inheritance: X- X-linked (Haemophilia and Colour Blindness) & Y-linked (Hypertrichosis) inheritance. Non-disjunction- Chromosomal Aberrations- Structural & Numerical and translocation of chromosomes Mutations: Types, mutagens, and molecular basis of mutation.

## UNIT III

DNA as the genetic material- experimental proof- DNA replication and repair mechanism- Fine structure of gene - Regulation of gene expression- operon concept (Lac operon)- Inborn errors of metabolism- Genetic counselling- Eugenics & Euthenics

## UNIT IV

Origin of life: Synthesis of organic molecules, Urey-Miller experiment Theories of Evolution- Lamarckism, Neo Lamarckism, Darwinism, Neo-Darwinism, Modern synthetic-Morphological, physiological, biochemical, embryological and palaeontological evidence- Geological time scale-Fossil & Fossilisation- Types, Living and Extinct fossils.

## UNIT V

Speciation and isolating mechanism - Isolating mechanisms - Modes of speciation, Genetic drift-Adaptive radiation-Hardy Weinberg equilibrium- Convergent, Divergent and Parallel evolution- Coevolution- Colouration and Mimicry - Evolution of Horse and Humans (Biological & Cultural).



**Text Books (Latest Editions)**

1. Gupta G. K., (2013), Genetics Classical to Modern, Rastogi publishers, Meerut.
2. Lewin B., (2008), Genes IX, Jones and Bartlett publishers.
3. Veer Bala Rastogi., (2019), Text Book of Genetics, Generic
4. Verma P.S and Agarwal V.K., (2006), Cell Biology, Genetics, Molecular Biology, Evolution and Ecology, S. Chand & Company Ltd.
5. Verma P. S. and V. K. Agarwal., (2018), Genetics, S. Chand & Company Pvt Ltd.
6. John C.Herron and Scott Freeman (2015), Evolutionary analysis. V Edition. Pearson Education

**Reference Books** (Latest editions, and the style as given below must be strictly adhered to)

1. Cooper, Geoffrey M., 2018. The cell: A Molecular Approach, Eighth Edition, Oxford University Press.
2. Dadson E.O. (1960). Evolution: Process and Product. Reinhold Pub.
3. Dobzhansky T., 1982. Genetics and The Origin of Species, Columbia University.
4. Fletcher H and Hickey I., 2015. Genetics, IV Edition. GS, Taylor and Francis Group, New York and London.
5. Gardner, Anne. 2009. Human Genetics, Scion Publishing Ltd.
6. Klug, W. S., Cummings, M. R., Spencer, C. A., 2012. Concepts of Genetics. X Edition. Benjamin Cummings.
7. Lodish, Harvey, Arnold Berk et al .,2007. Molecular cell biology. 6th edition, W. H. Freeman.
8. Russel, Peter J. 2013. iGenetics: A Molecular Approach, Pearson.
9. Strickberger M. W., 1995. Genetics, Prentice Hall India Learning Private Limited.

**Web Resources**

1. <https://go.nature.com/2XE8V1q>
2. <https://bit.ly/3zoTt6B>
3. <https://bit.ly/2XAm7oa>
4. <https://bit.ly/2XEbhxi>
5. <https://bit.ly/3AB4bso>
6. <https://bit.ly/39pZSE4>
7. <https://www.genome.gov/genetics-glossary/Sex-Linked>
8. <https://www.vedantu.com/biology/mutagens>

**LAB ON GENETICS AND EVOLUTION****Learning Objectives**

- To encourage the students to learn the usage of genetics experiments.
- To know the causes and effects of mutations.
- To encourage students to understand the significance of living fossils and know the contributions of famous evolutionists.



- To identify the variation in the animal kingdom and its role in evolution.
- To record the spotters and analyse the genetics and evolutionary theories.

### UNIT I

#### GENETICS

1. Breeding Experiment: Chi Square test to be illustrated with beads/ coin tossing  
a) Monohybrid Cross b) Dihybrid Cross.
2. Observation of Simple Mendelian traits in man – to be recorded.
3. Observation and study of Polygenic inheritance of quantitative traits to be interpreted in graphs:-  
a) height of students b) weight of students

### UNIT II

4. Identification of human blood groups to be analysed for the students
5. Culture of *Drosophila* and observation of mutants

### UNIT III

#### EVOLUTION

1. Gene Frequency: Hardy -Weinberg law- Probability Experiment.
2. Adaptive radiation: Feet / Beak of Birds
3. Visit to an evolutionary significance place.

### UNIT IV

**Spotters:** Normal karyotype in male and female, Down's syndrome, Klinefelter's syndrome, Turner's syndrome, Colour Blindness, Haemophilia, Hypertrichosis, Colouration and Mimicry: Lycodon and Krait; Stick insect, Leaf insect, and Animals of evolutionary significance: Peripatus, Archeopteryx, Limulus.

### UNIT V

Record / Observation Note (SUBMISSION IS MANDATORY)

#### Text Books (Latest Editions)

1. Surya Nandan Meena, Milind Naik, (2019), Advances in Biological Science Research: A Practical Approach, Academic Press, New York, USA.
2. Michael Perlin, William Beckerson, Adarsh Gopinath, (2017), Cell, Genetics, and Molecular Biology: A Lab Manual (First Edition), Cognella Inc., USA.
3. Mammata Behera, Rinny Swain, Aditya Pratap Singh, (2024), A Practical manual of fundamentals of Genetics, Bigfoot Publications.
4. Stricker, M.W., (1996), Evolution. Jones & Bartlett, USA
5. Dadson E.O. (1960), Evolution: Process and Product. Reinhold Pub.

#### Reference Books (Latest editions, and the style as given below must be strictly adhered to)

1. Robert F. Schleif, Pieter C. Wensink, (2012), Practical Methods in Molecular Biology, Springer-Verlag, NY, USA.
2. Sarah Stauffer, Aaron Gardner, Wilko Duprez, Dewi Ayu Kencana Ungu, Philip Wismer, (2018), Labster Virtual Lab Experiments: Basic Genetics, Springer Publishers, NY, USA.
3. Harth and Jones EW. 1998. Genetics – Principles and Analysis. Jones and



BarHett Publ. Boston.

4. Dr. Kishore R. Pawar, Dr. Ashok E. Desai, 2019. A text book of Organic Evolution, Nirali Prakashan,
5. Minkoff, E. C. (1983). Evolutionary biology. Reading, MA: Addison-Wesley Publishing Company

### Web Resources

1. <https://nbb.gov.in/>
2. <https://icar.org.in/>
3. <https://nisa.icar.gov.in/>
4. <https://www.nationalgeographic.com/animals/invertebrates/>

## CHEMISTRY FOR BIOLOGICAL SCIENCES II

(FOR BOTANY AND ZOOLOGY)

### Objectives of the course

This course aims to provide knowledge on

- nomenclature of coordination compounds and carbohydrates.
- Amino Acids and Essential elements of biosystem
- understand the concepts of kinetics and catalysis
- provide fundamentals of electrochemistry and photochemistry

### UNIT –I

**Co-ordination Chemistry:** Definition of terms IUPAC Nomenclature Werner's theory EAN rule Pauling's theory-Postulates- Applications to  $[\text{Ni}(\text{CO})_4]$ ,  $[\text{Ni}(\text{CN})_4]^{2-}$ ,  $[\text{Co}(\text{CN})_6]^{3-}$ , Chelation Biological role of Hemoglobin and Chlorophyll (elementary idea) - Applications in qualitative and quantitative analysis.

**Water Technology:** Hardness of water, determination of hardness of water using EDTA method, zeolite method-Purification techniques -BOD and COD.

### Unit- II

#### Carbohydrates

Classification, preparation and properties of glucose and fructose. Discussion of open chain ring structures of glucose and fructose. Glucose-fructose interconversion. Preparation and properties of sucrose, starch and cellulose.

### Unit- III

#### Amino acids and Essential elements of biosystem

Amino acids: Classification preparation and properties of alanine, preparation of dipeptides using Bergmann method. Proteins- classification – structure – colour reactions- Biological functions –nucleosides – nucleotides - RNA and DNA . - structure. Essentials of trace metals in biological system –Na, Cu, K, Zn, Fe and Mg



**UNIT- IV****Electrochemistry**

Galvanic cells - Standard hydrogen electrode calomel electrode - standard electrode potentials -electrochemical series. Strong and weak electrolytes - ionic product of water -pH, pKa, pKb. Conductometric titrations - pH determination by colorimetric method - buffer solutions and its biological applications electroplating - Nickel and chrome plating-Types of cells-fuel cells-corrosion and its prevention.

**UNIT –V****Photochemistry**

GrothusDrapper's law and Stark-Einstein's law of photochemical equivalence, Quantum yield Hydrogen -chloride reaction. Phosphorescence, fluorescence, chemiluminescence photosensitization and photosynthesis - definition with examples.

**Recommended Text**

1. V.Veeraian, Textbook of Ancillary Chemistry; High mount publishing house, Chennai, first edition, 2009.
2. S.Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur, 2006.
3. ArunBahl, B.S.Bahl, Advanced Organic Chemistry: S.Chand and Company, New Delhi, twenty third edition, 2012.
4. P.L.Soni, H.M.Chawla, Text Book of Organic Chemistry; Sultan Chand & sons, New Delhi, twenty ninth edition, 2007.

**Reference Books**

1. P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry: Sultan Chand and Company, New Delhi, twentieth edition, 2007.
2. B.R.Puri, L.R.Sharma, M.S.Pathania, Text book Physical Chemistry, Vishal Publishing Co., New Delhi, forty seventh edition, 2018.
3. B.K.Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.

**QUALITATIVE INORGANIC ANALYSIS (LAB)****Semi-Micro Qualitative Analysis**

1. Analysis of simple acid radicals: Carbonate, sulphide, sulphate, chloride, bromide, iodide, nitrate
2. Analysis of interfering acid radicals: Fluoride, oxalate, borate, phosphate.
3. Elimination of interfering acid radicals and Identifying the group of basic radicals
4. Analysis of basic radicals (group wise): Lead, copper, cadmium, nickel, cobalt, barium, ammonium.
5. Analysis of a simple salt containing one cation and one anion



**Recommended Text****Reference Books:**

1. V.Venkateswaran, R.Veera swamy and A.R.Kulandivelu, Basic Principles of Practical Chemistry, Sultan Chand & Sons, New Delhi, second edition, 1997.

**Website and e-learning source**

1. <https://www.vlab.co.in/broad-area-chemical-sciences>

## **BASICS OF MARINE BIOLOGY**

**Learning Objective**

- To understand and learn the physical, chemical and biological aspects of marine environment and to gain knowledge about the management of oceans.
- To introduce students to the marine environment and its indigenous organisms.
- To study the principles, concepts and facts through which the student can better understand and appreciate the nature of the sea and its inhabitants.
- To acquaint the student with the characteristics used to identify and classify marine plants and animals and to develop an awareness of the career possibilities available to students in this area.

**Unit I**

**Marine Ecology:** Marine environment- ecological factors- light, temperature, salinity, pressure; Classification of marine environment; Pelagic environment – Planktonic and Nektonic adaptations; Distribution and ecological role of other coastal environments - coral reefs, estuaries, mangroves, seagrass beds, kelp forests polar seas and hydrothermal vents.

**Unit II**

**Physical Oceanography:** Physical Properties of Seawater- density, viscosity, surface tension, conductivity and their relationship; temperature distribution in the sea - heat budget, UV radiation; Dynamics of the ocean-general surface circulation, Waves, Currents and Tides, Tsunami.

**Unit III**

**Chemical Oceanography:** Chemical composition of seawater- ionic, major and minor constituents, constancy- ionic compositions and factors affecting constancy- major and minor elements, trace elements- their importance, distribution. Chemistry of seawater constituents- concept of chlorinity and salinity - methods of measurements, nutrients - biogeochemical cycles.

**Unit IV**

**Biological Oceanography:** Sea as a biological environment- Plankton- classification based on size, mode of life and habitat. Phytoplankton and Zooplankton - methods of collection, estimation of standing crop-wet and dry weight estimation-plankton volume settling and displacement methods.



## Unit V

**Marine Pollution and Ocean Management:** Ocean pollution- kinds and quantities of pollutants, toxic effects and control measures – oil spills, plastics, nuclear waste disposal in marine environment, Eutrophication. Role of National and international agencies and organizations in ocean management-FAO, UNEP, DOD, WOCE, WHOI, IOI Malta, IMO INMARSAT- IUCN, SCAR, SCOR, Marpol, Traffic. Visit to a marine diversity centre and write a report.

### Text Books

1. Thurman, Harold., (2001), Introduction to Oceanography, Prentice Hall Inc. New Jersey. 506 pp.
2. Bertness, M.D, S. D. Gaines and M.K. Hay (2000), Marine Community Ecology Sinauer Associates.
3. Grant Gross, M., (1993), Oceanography: A view of the earth (sixth edition). Prentice Hall Inc. New Jersey.
4. Fincham A. A, (1984), Basic Marine Biology. Cambridge University Press, England. 157 pp.
5. John Resech Jr. (1979), Marine Biology. Reston Publishing Company, Virginia. 257 pp.

### Suggested Readings

1. Barbara E. Curry, (2016), Advances in Marine Biology, Volume 74, 1st Edition. Academic Press ISBN: 9780128036075
2. Peter Castro, Michael E. Huber, (2015), Marine Biology; Series Botany, Zoology, Ecology and Evolution. McGraw-Hill Education.
3. Philip V. Mladenov, (2013), Marine Biology: A very short introduction, 1st Edition. Oxford University Press.
4. Venkataraman K, Raghunathan C, Raghuraman R, Sreeraj C. R, (2012), Marine diversity in India. Zoological Survey of India, Kolkata.178 pp.
5. Amy Hill. (2002), Marine Biology: An Introduction to Ocean Ecosystems (Marine Biology Ser) Walch publishing.
6. Pickard, G.L. and W.J. Emery 1995. Descriptive Physical Oceanography. Pergamon Press, London.
7. Gage. J.D. and P.A. Tyler, 1991. Deep Sea Biology, Cambridge University Press, Cambridge
8. Raymond J. E. G., 1980. Plankton and Productivity in the oceans: Volume 1: Phytoplankton, Pergamon Press.
9. Van Der Spoel, S. and Pierrot-Bults, A. C (Eds) 1979. Zoogeography and diversity of plankton. Bungs Scientific Publishers Utrecht, 410pp.
10. Riley, J.P. and Skirrow, 1975-1984. Chemical Oceanography Vols. 1 to 8. Academic Press, London

### Web Resources

1. <https://www.livescience.com>
2. <https://www.icriforum.org>
3. <https://www.cbd.int>



# WILDLIFE CONSERVATION AND MANAGEMENT

## Learning Objectives

- To understand and discuss the importance of wildlife, its values, modern concepts in wildlife management, and relevant conservation policies.
- To assess and instil strong foundations on wildlife policies and be familiar with a variety of laws and regulations.
- To analyse and design appropriate approaches to turn conflict into tolerance and coexistence, with an emphasis on the human dimensions of human-wildlife interactions.
- To evaluate and integrate all the related areas like Fundamentals in Ecology, Forestry, and Natural Resource Conservation approaches and develop the role PVA models for the protection of Endangered species.
- To explain the advanced scientific basis for wildlife management and discuss National and International Efforts for successful wildlife conservation.

## Unit I

**Biodiversity Extinction and Conservation Approaches:** Perspectives and Expressions. Identification and prioritisation of Ecologically sensitive areas (ESA). Coarse filter and fine filter approaches. Regional and National approaches for biodiversity conservation.

## Unit II

**Theory and Analysis of Conservation of Populations:** Stochastic perturbations - Environmental, Demographic, spatial and genetic stochasticity. Population viability analysis-conceptual foundation, uses of PVA models. Management Decisions for small populations using PVA models. Minimum viable populations & recovery strategies for threatened species.

## Unit III

**National and International Efforts for Conservation:** International agreements for conserving marine life, Convention on Wetlands of International Importance (Ramsar Convention), Conservation of Natural Resources. Overview of conservation of Forest & Grassland resources. CITES, IUCN, CBD National Forest Policy, 1988, National Wildlife Action Plan 2017-2031, Wildlife Protection Act 1972, National and State Biodiversity Action Plans and other Forests and Environmental Acts.

## Unit IV

**Wildlife in India:** Wildlife wealth of India & threatened wildlife, Reasons for wildlife depletion in India, Wildlife conservation approaches and limitations. Wildlife Habitat: Characteristic, Fauna and Adaptation with special reference to Tropical forest. Protected Area concept: National Parks, Sanctuaries and Biosphere Reserves, Unit V: Management of Wildlife: Distribution, status. Habitat utilization pattern, threats to the survival of Slender Loris, Musk deer, Great Indian Bustard, Olive Ridley turtle. Wildlife Trade & legislation, Assessment, documentation, Prevention of trade, Wildlife laws and ethics. Visit a Sanctuary or Biosphere reserve and write a report.



**Text Books:**

1. Robinson W L and Eric G Bolen, (1984), Wildlife Ecology and Management, Macmillan Publishing Company, New York, p 478.
2. Aaron, N.M. (1973), Wildlife ecology, W.H. Freeman Co. San Francisco, U.S.A.
3. Dasmann R F, (1964), Wildlife Biology, John Wiley & Sons, New York, p 231.
4. Justice Kuldip Singh (1998), Handbook of Environment, Forest and Wildlife Protection Laws in India, Natraj Publishers, Dehradun.
5. Hosetti, B.B. (1997), Concepts in Wildlife Management, Daya Publishing House, Delhi.
6. Sutherland, W.J (2000), The conservation handbook: Research, Management and Policy. Blackwell Science.
7. Caughley.G and Sinclaire, A.R.E (1994), Wildlife ecology and management. Blackwell Science.
8. Woodroffe R, Thirgood, S. and Rabinowitz A. (2005), People and Wildlife, Conflict or Co-existence?, Cambridge University.
9. Sinha, P.C. (1998), Wildlife and Forest Conservation, Anmol Publishing Pvt. Ltd., New Delhi.
10. Singh, S.K, (2005), Text Book of Wildlife Management. IBDC, Lucknow.

**Suggested Readings**

1. Gilas R H Jr.(ed.), (1984), Wildlife Management Techniques, 3rd ed. The Wildlife Society, Washington D.C., Nataraj Publishers, Dehra Dun, p 547.
2. Rodgers W A, (1991), Techniques for Wildlife Census in India - A Field Manual: Technical Manual - T M - 2. WII.
3. Saharia V B, (1982), Wildlife of India, Natraj Publishers, Dehra Dun.
4. Goutam Kumar Saha and Subhendu Mazumdar, (2017), Wildlife Biology: An Indian Prospective, PHI Publisher, Delhi.
5. Katwal/Banerjee, (2002), Biodiversity conservation in managed and protected areas, Agrobios, India.
6. Gopal, Rajesh, (1992), Fundamentals of Wildlife Management, Justice Home, Allahabad, India.
7. Sharma, B.D, (1999), Indian Wildlife Resources Ecology and Development, Daya Publishing House, Delhi.
8. Stephen, H.B. and V.B. Saharia, (1995), Wildlife research and management. Asian and American Approaches, Oxford University Press, Delhi.
9. Negi, S.S. (1993), Biodiversity and its conservation in India, Indus Publishing Co., New Delhi.
10. Moulton, M. P. & J. Sanderson, (1997), Wildlife Issues in a Changing World. St. Lucie Press.

**Web resources**

1. <https://bit.ly/39oPj44>
2. <https://bit.ly/3IHdEYJ>
4. <https://bit.ly/3CwBCfY>
5. <https://bit.ly/3EDYr3a>
6. <https://bit.ly/3tVtG4U>



# VALUE BASED EDUCATION

## Unit-I Introduction to Value based Education

- a. Value: meaning and Classification
- b. Value based Education: Meaning, Characteristics, Components and Contents
- c. Value Erosion and Inculcation: Value crises in social life, economic life, and political life - Value inculcation: need and importance - Role of Parents and Teachers in inculcating values

## Unit-II Harmony in Being and Living

- a. Harmony of the self (I) with the body: Nurturing of the body- Understanding myself as co-existence of the self and the body- Understanding needs of self and needs of the body- Understanding the activities in the self and activities in the body.
- b. Harmony in the Family, Society and Nature: Family as a basic unit of human interaction and values in relationships - Affection, care, guidance, reverence, Glory, gratitude, and love – Harmony in society: Justice preservation, Production Work, Exchange Storage Harmony in nature: four orders in nature- The holistic perception of harmony in existence.

## Unit III: Social Issues, Social Justice and Human Rights

**Social issues** – causes and magnitude - alcoholism, drug addiction, poverty, unemployment

**Social Justice:** Definition and need – factors responsible for social injustice: caste and gender – contributions of social reformers.

**Human Rights:** Concept and Principles of human rights – human rights and Indian constitution – Rights of Women and children – violence against women

## Unit IV: Values and Mass Media

**Mass media:** Meaning, functions and characteristics – Effects and Influence on youth and children – **Media Power** – socio, cultural and political consequences of mass mediated culture - consumerist culture – Globalization – new media- prospects and challenges – Role of media in value building

## Unit V: Ethics

**Ethics:** Meaning and importance

Social ethics: tolerance, equity, justice for all, sensitivity towards mankind, love for nature and creatures, nationalism-love for nation, pride for nation, Honour to the law, Indian culture and traditions – Civic Sense: Being a good civilian

**Professional Ethics:** Dedication to work and duty – Commitment to the Profession



**References:**

1. Allport, G.W., Vernon, P.E., and Lindzey, G. (1970) study of values, Boston: Houghton Mifflin.
2. Central Board of Secondary Education (1997), Value Education: A Handbook for Teachers, Delhi: Central Board of Secondary Education.
3. Delors, J. (1996), Learning: The Treasure within- Report of the International Commission on Education for the Twenty-First Century, Paris: UNESCO.
4. Morris, Charles W. (1956). Varieties of Human Values. Chicago: University of Chicago Press.
5. Shukla, R.P. (2005). Value Education and Human Rights. Sarup & Sons, New Delhi
6. Satchidananda. M.K. (1991), "Ethics, Education, Indian Unity and Culture" – Delhi, Ajantha Publications
7. Saraswathi. T.S. (Ed) 1999. "Culture", Socialisation and Human Development: Theory, Research and Application In India" – New Delhi Sage Publications.
8. Venkataiah. N (Ed) 1998, "Value Education" New Delhi Ph. Publishing Corporation.
9. Chakraborti, Mohit (1997) "Value Education: Changing Perspectives" New Delhi: Kanishka Publications.

**Web Resources**

1. <https://testbook.com/ugc-net-paper-1/value-education>



# NAN MUDTHALVAN COURSE-3 BASIC COURSE IN ORNITHOLOGY\*

\* Substitute paper exclusively for reappearance only

## Learning Objectives

- To equip students with the required knowledge to understand the taxonomic position and role played by birds in the ecosystem, their importance to humans and their evolution
- To enable students to comprehend the biological evolution of birds and their structural adaptations
- To enable students to understand and learn aspects of bird behaviour
- To enable students to learn about the breeding biology of birds
- To equip students with a knowledge of macroecology of birds, bird populations and communities, bird diseases, bird conservation and on the role of citizen science in ornithology.

## Unit I

Introduction to Ornithology; Bird Lore; Birds and Humans; Classification of Birds, Bird Evolution and Speciation; Endemism

## Unit II

External Morphology of the Bird; Structure of bird feather, Internal Structure of the Bird; Adaptations to Flight

## Unit III

Bird Behaviour: Foraging, Roosting, Vocalization, Imprinting, Feather care, Bird Intelligence, Social Behaviour, Mixed Species Flocks, Migration

## Unit IV

Breeding Biology: Differential investment of sexes; territoriality, courtship and display behaviour, nesting, eggs, incubation and care of young, brood parasitism

## Unit V

Studying bird populations and communities, sampling methods; Macro ecology; Molecular Techniques in Ornithology; Avian Disease; Citizen Science and Ornithology; Threats faced by birds; Bird Conservation with case studies

## Books For Reference

1. Lovette, I.J and Fitzpatrick, J.W. (2016). Handbook of Bird Biology, 3rd ed. Wiley.
2. Birkhead, T. (2013). Bird Sense: What it's like to be a bird? Bloomsbury, NY.
3. Birkhead, T., Wimpenny, J., and Montgomerie, B. (2014). Ten Thousand Birds: Ornithology since Darwin. Princeton University Press, Princeton, NJ.
4. Gill, F.B, and Prum, R.O. (2019). Ornithology, 4th ed. Macmillan.

