



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 2023-2024 onwards)



Semester-II				
Part	Subject Status	Subject Title	Subject Code	Credit
I	Language I	TAMIL/ MALAYALAM/ HINDI	E1TL21/ E1MY21/ E1HD21	3
II	Language II	ENGLISH	E2EN21	3
III	Core	CHORDATA	EMZO21	5
III	Core	LAB ON CHORDATA	EMZOP2	3
III	Elective	ALLIED BOTANY II	EEBO21	3
III	Elective	LAB ON ALLIED BOTANY II	EEBOP2	2
IV	SEC - 2	BIO COMPOSTING FOR ENTREPRENEURSHIP	ESZO21	2
IV	SEC - 3	ANIMAL BEHAVIOUR	ESZO22	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 **1 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 – I TAMIL

### Learning Objectives:

- முதலாமாண்டுப் பட்ட வகுப்பு மாணவர்களுக்குத் தமிழ் மொழி இலக்கியங்களை அறிமுகம் செய்தல்
- தமிழ் இலக்கியப் போக்குகளையும், இலக்கணங்களையும் மாணவர் அறியுமாறு செய்து அவர்களின் படைப்பாற்றலைத் தூண்டுதல்
- தமிழ் இலக்கியம் சார்ந்த போட்டித் தேர்வுகளுக்கு ஏற்ப கற்பித்தல் நடைமுறைகளை மேற்கொள்ளுதல்

### அலகு 1:

#### தமிழ் இலக்கிய வரலாறு அறிமுகம்.

1. சிற்றிலக்கியம்; குறவஞ்சி, கலம்பகம், உலா, பரணி, பள்ளு பிள்ளைத்தமிழ், தூது, அந்தாதி
2. தனிப்பாடல் அறிமுகம்
3. இக்கால இலக்கியம் :- கவிதை, சிறுகதை நாடகம், உரைநடை, திராவிட இயக்கம் வளர்த்த தமிழ்.

### அழகு 2

#### சிற்றிலக்கியமும், தனிப்பாடலும்

#### சிற்றிலக்கியம்:

1. கலிங்கத்து பரணி-விருந்தினருக்கு வறியவரும் நெருங்கியுண்ண முதல் கேட்பாரைக் காண்மின் காண்மின் வரை (5 பாடல்கள்)
2. திருக்குற்றாலக் குறவஞ்சி - வானரங்கள் கனிகொடுத்து
3. முக்கூடற் பள்ளு - ஆற்று வெள்ளம் நாளை வரத்
4. அபிராமி அந்தாதி - கலையாத கல்வியும் குறையாத வயதும் (பதினாறு செல்வங்கள்)
5. திருவரங்கக் கலம்பகம் - மறம் பேசவந்த தூது செல்லரித்த ஓலை சொல்லுமோ (பிள்ளைப் பெருமாள் ஐயங்கார்)
6. தமிழ்விடு தூது -முதல் பதுக் கண்ணிகள்

#### தனிப்பாடல்;

1. வான்குருவி யின்கூடு - ஓளவையார்
2. ஆமணக்குக்கும் யானைக்கும் சிலேடை - முதிருக்கும் கொம்பசைக்கும் மூரிதண்டேந்தி - காளமேகப் புலவர்
3. இம்பர் வான் எல்லை இராமனையே பாடி - வீரராகவர்
4. நாராய் நாராய் - சத்தி முத்தப் புலவர்

### அலகு 3 இக்கால இலக்கியம் 1

1. பாரதியார் பாரத சமுதாயம் வாழ்கவே
2. பாரதிதாசன் - சிறுத்தையே வெளியில் வா
3. நாமக்கல் கவிஞர் - கத்தியின்றி
4. தமிழ் ஒளி - மீன்கள்
5. ஈரோடு தமிழன்பன் - எட்டாவது சீர் (வணக்கம் வள்ளுவ - தொகுப்பு)

#### சிறுகதைகள்:

1. புதுமைப்பித்தன் - கடிதம்
2. ஜெயகாந்தன் - வாய்ச் சொற்கள் (மாலை மயக்கம் - தொகுப்பு )
3. ஆர். சூடாமணி - அந்நியர்கள்
4. உரைநடை:
5. மு.வ. கடிதங்கள் - தம்பிக்கு நூலில் முதல் இரண்டு கடிதங்கள்

### அலகு - 4 இக்கால இலக்கியம் - 2

1. தந்தை பெரியார் - திருக்குறள் மாநாட்டு உரை



2. பேரறிஞர் அண்ணா - இரண்டாம் உலகத் தமிழ் மாநாட்டு உரை
3. கலைஞர் மு கருணாநிதி - தொல்காப்பிய பூங்கா - எழுத்து - நூற்பா கட்டுரை

#### நாடகம்/திரைத்தமிழ்:

1. வேலைக்காரி - திரைப்படம்
2. ராஜா ராணி - சாக்ரடீஸ் - ஓரங்க நாடகம்

#### இதழியல் தமிழ்:

##### முரசொலி கடிதம்

1. செம்மொழி வரலாற்றில் சில செப்பேடுகள்

##### அலகு 5 மொழி பயிற்சி

##### சொல் வேறுபாடு/பிழை தவிர்த்தல்

- வாசிப்பது - வாசிப்பவர்
- சுவர் - சுவரில்
- வயிறு - வயிற்றில்
- கோயில் - கோவில்
- கருப்பு - கறுப்பு
- இயக்குநர் - இயக்குனர்
- சில்லறை - சில்லரை
- முறித்தல் - முறிதல்
- மனம் - மனசு - மனது
- அருகில் - அருகாமையில்
- அக்கரை - அக்கறை
- மங்கலம் - மங்களம்

##### பயிற்சி:

- பிழையான சொற்களை ஒரு பத்தியில் கொடுத்து அந்தப் பிழையான சொற்களைச் சரியாகச் எழுதச் செய்தல்
- சிறிய பத்தி ஒன்றை ஆங்கிலத்தில் கொடுத்து அதனைத் தமிழில் மொழிபெயர்க்க வைத்தால்.

##### Text Books

##### Reference Books

1. மு. வரதராசன், தமிழ் இளகிய வரலாறு, சாகித்ய அக்காதெமி, புதுடெல்லி.
2. மது.ச. விமலானந்தன், தமிழ் இலக்கிய வரலாறு, மீனாட்சி புத்தக நிலையம், மதுரை.
3. தமிழண்ணல், புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு, மீனாட்சி புத்தக நிலையம், மதுரை.
4. தமிழ் இலக்கிய வரலாறு - முனைவர். சிற்பி பாலசுப்ரமணியம், நீல. பத்மநாபன்
5. தமிழ் இலக்கிய வரலாறு - டாக்டர் எ.கா. பெருமாள்
6. தமிழ் இலக்கிய வரலாறு - முனைவர். ப. ச. ஏசுதாசன்
7. தமிழ் இலக்கிய வரலாறு - ஸ்ரீ குமார்
8. வகைமை நோக்கில் தமிழ் இலக்கிய வரலாறு - பாக்கியமேரி
9. தமிழ் பயிற்றும் முறை, பேராசிரியர் ந. சுப்புரெட்டியார் - மணிவாசகர் - பதிப்பகம், சிதம்பரம்

##### Web Sources:

- <https://www.chennaiibrary.com/>
- <https://www.sirukathaigal.com/>
- <https://www.tamilvirtualuniversity.org/>
- <https://www.noolulagam.com/>
- <https://www.katuraitamilblogspot.com/>



## **PART I MALAYALAM**

### **Course Objectives**

1. To give compressive view of communication and its scope and importance in official communication and business communication

### **Unit I:**

This unit introduces basic communication skills in Malayalam. Salutation, Discourse markers, formal and informal communication strategies are also introduced.

### **Unit II:**

This unit introduces word processing and Editing text Auto correct- spell check & grammar check, undo& redo Text formatting Changing case, drop caps, coloring & highlighting text, adding special characters, bullets & numbering.

### **Unit III**

This unit introduces the document formation compositional and typographical ways. Advanced page layout in word Borders, box, shading, page fills & back ground Module and Table & columns Creating tables Inserting tables from the menu & tool bar, drawing tables Manipulating tables Selecting tables elements, inserting & deleting columns & rows, adjusting table properties, are introduced . This unit introduces the Printing word documents Using print preview.

Practical knowledge in different fonts and Unicode

### **Unit IV**

This Unit Introduces blog writing, technical writing, content editing, Proof reading, new making (Writing for career)

### **Unit V**

This unit introduces Malayalam for Competitive Exams. Reading comprehension, reasoning, inferential comprehension, analogical creations( Competitive Malayalam)

### **Unit VI**

Malayalam for language Specific Exams for writing UPSC, PSC Exams

### **Recommended Text:**

1. Bharanabhasha: The State language Institute Business Communication for Success: Publisher: University of Minnesota Libraries Publishing



## **PART I HINDI - Kahani, Ekanki aur Vyakran**

### **Course Objectives**

The Main Objectives of this course are these courses are to

- Introduction to Hindi fiction
- Teaching of social values through stories and skits
- Practical application of grammar

### **Unit I**

#### **Hindi Katha-Sahitya: Parichay**

- 1 Kahani ke Tatva
2. Hindi ke Pramukh kahanikaro ka Parichay
3. Ekanki ke Tattva
4. Hindi ke Pramukh Ekankikaro ka Parichay

### **Unit II**

#### **Hindi Kahaniya**

- 1 Premchand – Bade Ghar ki Beti
- 2 Malathi Joshi – Vo Tera Ghar Yah Mera Ghar
- 3 Pita - Gyanranjan

### **Unit III**

#### **Hindi Ekanki**

- 1 Lakshmi ka Swagat – Upendranath Ashk
- 2 Vibhajan – Vishnu Prabhakar
- 3 Maa Baap – Sri Vishnu

### **Unit IV**

#### **Vyakaran**

- 1 Kriya Visheshan
- 2 Sambandh Bodhak
- 3 Samuchay Bodhak
- 4 Vismayadi Bodhak aadi shabdo ka prayog

### **Unit V**

#### **Pratiyogi Pariksha par aadharit Nimnalikhit Vishayo se sambandhit Prashikshan Karya**

- 1 Tamil Bhasha: Mahakavi Bharatiyar
- 2 Sanket Vikas dwara Lekhan kala aur Kahani Lekhan ka Vikas
- 3 Gadyansh dekhkar sahi Shirshak chunna
- 4 Pathit Vyakaran par aadharit Vakya rachna
- 5 Vibhinna Pratiyogi parikshao ke bare mein suchna pradan dena

#### **Reference Books**

- 1 Aath Ekanki Natak – Ed. Dr. Ramkumar Verma
- 2 Das Ekanki

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

1. Lokpriya Kahaniya: <https://www.hindwi.org/sangrahaalay/100-best-stories-inhindii>
2. Vo Tera Ghar Ye Mera Ghar : [http://gadyakosh.org/gk/%E0%A4%B5%E0%A5%8B\\_%E0%A4%A4%E0%A5%87%E0%A4%B0%E0%A4%BE\\_%E0%A4%98%E0%A4%B0/\\_%E0%A4%AF%E0%A5%87\\_%E0%A4%AE%E0%A5%87%E0%A4%B0\\_%E0%A4%B2%E0%A4%A4%E0%A5%80\\_%E0%A4%9C%E0%A5%8B%E0%A4%B6%E0%A5%80](http://gadyakosh.org/gk/%E0%A4%B5%E0%A5%8B_%E0%A4%A4%E0%A5%87%E0%A4%B0%E0%A4%BE_%E0%A4%98%E0%A4%B0/_%E0%A4%AF%E0%A5%87_%E0%A4%AE%E0%A5%87%E0%A4%B0_%E0%A4%B2%E0%A4%A4%E0%A5%80_%E0%A4%9C%E0%A5%8B%E0%A4%B6%E0%A5%80)
3. <https://hindistory.net/>



## **PART II ENGLISH**

### **Learning Objectives**

- LO1 To make students realize the importance of resilience
- LO2 To enable them to become good decision makers
- LO3 To enable them to imbibe problem-solving skills
- LO4 To enable them to use tenses appropriately
- LO5 To help them use English effectively at the work place.

### **Unit I**

#### **RESILIENCE**

##### **Poem**

- 1.1 Don't Quit – Edgar A. Guest
- 1.2 Still Here – Langston Hughes

##### **Short Story**

- 1.3 Engine Trouble – R.K. Narayan
- 1.4 Rip Van Winkle – Washington Irving

### **Unit II**

#### **DECISION MAKING**

##### **Short Story**

- 2.1 The Scribe – Kristin Hunter
- 2.2 The Lady or the Tiger - Frank Stockton

##### **Poem**

- 2.3 The Road not Taken – Robert Frost
- 2.4 Snake – D. H Lawrence

### **Unit III**

#### **PROBLEM SOLVING**

##### **Prose life Story**

- 3.1 How I taught My Grandmother to Read – Sudha Murthy  
Autobiography
- 3.3 How frog Went to Heaven – A Tale of Angolo
- 3.4 Wings of Fire (Chapters 1,2,3) by A.P.J Abdul Kalam

### **Unit IV**

#### **Tenses**

- 4.1 Present
- 4.2 Past
- 4.3 Future
- 4.4 Concord

### **Unit V**

#### **English in the Workplace**

- 5.1 E-mail – Invitation, Enquiry, Seeking Clarification
- 5.2 Circular
- 5.3 Memo
- 5.4 Minutes of the Meeting

#### **Text Books (Latest Editions)**

#### **References Books**



1. Martin Hewings. Advanced English Grammar. Cambridge University Press, 2000
2. SP Bakshi, Richa Sharma. Descriptive English. Arihant Publications (India) Ltd., 2019.
3. Sheena Cameron, Louise Dempsey. The Reading Book: A Complete Guide to Teaching Reading. S & L. Publishing, 2019.
4. Barbara Sherman. Skimming and Scanning Techniques, Liberty University Press, 2014.
5. Phil Chambers. Brilliant Speed Reading: Whatever you need to read, however. Pearson, 2013.
6. Communication Skills : Practical Approach Ed. Shaikh Moula Ramendra Kumar. Stories of Resilience, Blue Rose Publications, 2020.

### Web Sources

- 1 Langston Hughes. Still Here  
<https://poetryace.com/im-still-here>
- 2 R. K. Narayan. Engine Trouble  
<http://www.sbioaschooltrichy.org/work/Work/images/new/8e.pdf>
- 3 Washington Irving. Rip Van Winkle  
<https://www.gutenberg.org/files/60976/60976-h/60976-h.htm>
- 4 Frank Stockton. The Lady or the Tiger <https://www.gutenberg.org/ebook>

## CHORDATA

### Learning Objectives

- To understand the structures and distinct features of Phylum Chordata.
- To understand and able to distinguish the characteristic features of each subphylum and class.
- To understand the economic importance of vertebrates
- To know about the adaptations of vertebrates
- To understand the evolutionary position of different groups of vertebrates

### UNIT I

**General Characters and Classification of Phylum Chordata:** Origin of Chordata, Differences between non-chordates and chordates, General characters, Affinities and Systematic position of Hemichordata (*Balanoglossus*), Urochordata (*Ascidia*), Cephalochordata (*Amphioxus*).

### UNIT II

**Prochordates and Agnatha:** Characteristics of subphylum Vertebrata, Classification of Vertebrata upto Class level, Agnatha (*Petromyzon*), - Pisces (*Scoliodon sorrakowah*). General characters and classification of Pisces, Origin of fishes, Affinities of Dipnoi - Types of scales and fins - Accessory respiratory organs - Air bladder - Parental care - Migration - Economic importance.





**UNIT III**

**Amphibia:** General characters and classification - Origin of Amphibia - Type study : *Rana hexadactyla* - Adaptive features of Anura, Urodela and Apoda - Neoteny in Urodela - Parental care in Amphibia.

**UNIT IV**

**Reptilia:** General characters and classification - Type study: *Calotes versicolor* - Origin of reptiles and effects of terrestrialisation, Extinct reptiles. Snakes of India. Poison apparatus and biting mechanism of poisonous snakes - Skull in reptiles as basis of classification

**UNIT V**

**Aves and Mammalia:** Aves: General characters and classification – Type study: *Columba livia* - Origin of birds, Flight adaptations, Migration. Mammalia: General characters and classification - Type study: Rabbit - Adaptive radiation in mammals - Egg laying mammals, Marsupials, Flying mammals, Aquatic mammals, Dentition in mammals.

**Text Books** (Latest Editions)

1. Ayyar, E.K. and T.N. Ananthakrishnan, 1992. Manual of Zoology Vol. II (Chordata), S. Viswanathan (Printers and Publishers) Pvt Ltd., Madras, 891p.
2. Jordan, E.K. and P.S. Verma, 1995. Chordate Zoology and Elements of Animal Physiology, 10th edition, S. Chand & Co Ltd., Ram Nagar, New Delhi, 1151 pp.
3. Nigam, H.C., 1983. Zoology of Chordates, Vishal Publications, Jalandhar - 144008, 942.
4. Ganguly, Sinha., Bharati Goswami and Adhikari, 2004. Biology of animals Vol.II - New central book Agency (p) Ltd.
5. Kotpal. R.L. A, Modern text book of Zoology Vertebrates- Rastogi publications. 2009

**References Books**

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

1. Darlington P.J. The Geographical Distribution of Animals, R.E. Krieger Pub. Co.
2. Hall B.K. and Hallgrimsson B. (2008). Strickberger's Evolution. IV Edition. Jones and Bartlett Publishers Inc.
3. Hickman, C.P. Jr., F.M.Hickman and L.S. Roberts, 1984. Integrated Principles of Zoology, 7th Edition, Times Merror/Mosby College Publication. St. Louis. 1065 pp.



4. Newman, H.H., 1981. The Phylum Chordata, Satish Book Enterprise, Agra – 282 003, 477 pp.
5. Parker and Haswell, 1964. Text Book of Zoology, Vol II (Chordata), A.Z.T,B.S. Publishers and Distributors, New Delhi - 110 051, 952 pp.
6. Pough H. Vertebrate life, VIII Edition, Pearson International.
7. Waterman, Allyn J. et al., 1971. Chordate Structure and Function, Mac Millan &Co., New York, 587 pp.
8. Young, J. Z. (2004). The Life of Vertebrates. III Edition. Oxford university press.

### Web Resources

1. <http://tolweb.org/Chordata/2499>
2. <https://www.nhm.ac.uk/>
3. <https://bit.ly/3Av1Ejg>
4. <https://bit.ly/3kqTfYz>
5. <https://biologyeducare.com/aves/>
6. <https://www.vedantu.com/biology/mammalia>

## LAB ON CHORDATA

### Learning Objectives

- To understand the structures and distinct features of Phylum Chordata.
- To understand and able to distinguish the characteristic features of each subphylum and class.
- To understand and compare the structure of various internal organs in different classes of vertebrates.
- To know about the classification, adaptations and affinities of chordate animals.

### UNIT I

**Dissections:** (Virtual) Frog (Demo) / Fish: External features, Digestive system, Arterial system, Venous system, 5thCranial nerve.-

### UNIT II

**Mounting:** **Fish:** Placoid and Ctenoid scales,  
**Frog:** Hyoid apparatus and Brain (Demonstration).

### UNIT III

**Osteology:** **Frog/ mammal:** Skull and lower jaw, Vertebral column, Pectoral girdle, Pelvic girdle, Fore limb, Hind limb, **Chelonia:** Anapsid skull, **Pigeon:** skull, lower jaw and synsacrum.

### UNIT IV

**Specimen and Slides:** (i) **Hemichordata:** Balanoglossus, Tornaria larva (ii). **Protochordata:** Amphioxus, Amphioxus (iii). **Cyclostomata:** Petromyzon, Ammocoetus larva (iv). **Pisces:** Shark, Pristis, Torpedo, Anabus, Cybium,



Hippocampus, Exocoetus, Echieneis, Labeo, Catla, Clarius, Anguilla, Protopterus, (v). **Amphibia:** Ichthyophis, Amblystoma, Hyla, Rachophous, Bufo, Rana, Axolotal larva (vi). **Reptilia:** Draco, Chamaeleon, Vipera russelli, Naja, Bungarus, Enhydrina, Typhlops, Trionyx, Crocodilus, Chelon. (vii). **Aves:** Archaeopteryx, Passer, Psittacula, Bubo, Alcedo, Columba, Corvus, Pavo; Collection and study of different types of feathers: Quill, Contour, Filoplume, Down (viii). **Mammalia:** Ornithorhynchus, Pteropus, Manis, Loris, Hedgehog

**Text Books** (Latest Editions)

1. Lal S S, 2009. Practical Zoology Vertebrate, Rajpal and Sons Publishing, 484pp.
2. Verma P.S, 2000. A Manual of Practical Zoology: Chordates, S. Chand Limited, 627pp.

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

1. Robert William Hegner, 2015. Practical Zoology, BiblioLife, 522pp.
2. Young, J.Z., 1972. The life of vertebrates. Oxford Uni. London.

**Web Resources**

1. [https://www.youtube.com/watch?v=b04hc\\_kOY10](https://www.youtube.com/watch?v=b04hc_kOY10)
2. <https://bit.ly/3CzTEy8>
3. <http://tolweb.org/Chordata/2499>
4. <https://www.nhm.ac.uk/>
5. <https://bit.ly/3Av1Ejg>

## ALLIED BOTANY-II

### Learning Objectives

- To be familiar with the basic concepts and principles of plant systematics.
- Learn the importance of plant anatomy in plant production systems.
- Understand the mechanism underlying the shift from vegetative to reproductive phase.
- To learn about the physiological processes that underlie plant metabolism.
- To know the energy production and its utilization in plants.

### UNIT I

#### MORPHOLOGY OF FLOWERING PLANTS:

Plant and its parts. Structure and function of root and stem. Leaf and its parts. Leaf types- simple and compound. Phyllotaxy and types. Inflorescence - Racemose, Cymose and Special types. Terminology with reference to flower description.

### UNIT II

#### TAXONOMY:

Study of the range of characters and plants of economic importance in the following families: Rutaceae, Caesalpiniaceae, Asclepiadaceae, Euphorbiaceae and Cannaceae



### UNIT III ANATOMY

**Tissue and tissue systems:** Simple and complex tissues. Anatomy of monocot and dicot roots - anatomy of monocot and dicot stems - anatomy of dicot and monocot leaves.

### UNIT IV EMBRYOLOGY

Structure of mature anther and ovule - Types of ovules, structure of embryo sac, pollination -double fertilization, structure of dicotyledonous and monocotyledonous seeds.

### UNIT V PLANT PHYSIOLOGY

Absorption of water, photosynthesis - light reaction - Calvin cycle; respiration - Glycolysis - Krebs cycle - electron transport system. Growth hormones - auxins and cytokinins and their applications.

#### Recommended Texts

1. Sharma, O.P. 2017. Plant Taxonomy. (II Edition).The McGraw Hill Companies.
2. Bhojwani, S.S. Bhatnagar, S.P and Dantu, P.K. 2015. The Embryology of Angiosperms (6th revised and enlarged edition). Vikas Publishing House, New Delhi.
3. Maheshwari, P. 1963. Recent Advances in Embryology of Angiosperms. Intl. Soc. Plant Morphologists, New Delhi.
4. Salisbury, F. B.C.W. Ross.1991. Plant Physiology. Wassworth Pub. Co. Belmont.
5. Ting, I.P. 1982. Plant Physiology. Addison Wesley Pb. Philippines.

#### Reference books

1. Lawrence.G.H.M. 1985. An Introduction to Plant Taxonomy, Central Book Depot, Allahabad.
2. Bhojwani, S.S and Bhatnagar, S.P. 2000. The Embryology of Angiosperms (4th revised and enlarged edition). Vikas Publishing House, New Delhi.
3. Pandey, B.P. 2012. Plant Anatomy. S Chand Publishing.
4. Jain, VK. 2006. Fundamentals of Plant Physiology, S. Chand and Company Ltd.
5. Rajni Gupta. 2012. Plant Taxonomy: Past, Present and Future. Vedams (P) Ltd. New Delhi.
5. Jain, V.K. 2006. Fundamentals of Plant Physiology, S.Chand and Company



Ltd., New Delhi.

6. Verma, S.K. 2006. A Textbook of Plant Physiology, S.K.Chand & Co., New Delhi.

### Web Resources

1. [https://books.google.co.in/books/about/Plant\\_Taxonomy.html?id=0bYs8F0Mb9gC&redir\\_esc=y](https://books.google.co.in/books/about/Plant_Taxonomy.html?id=0bYs8F0Mb9gC&redir_esc=y)
2. [https://books.google.co.in/books/about/PLANT\\_TAXONOMY\\_2E.html?id=Roi0lwSXFuUC&redir\\_esc=y](https://books.google.co.in/books/about/PLANT_TAXONOMY_2E.html?id=Roi0lwSXFuUC&redir_esc=y)
3. <https://archive.org/EXPERIMENTS/plantanatomy031773mbp>
4. <https://www.amazon.in/Embryology-Angiosperms-6th-S-P-Bhatnagar-ebook/dp/B00UN5KPQG>
5. <https://www.crcpress.com/Plant-Physiology/Stewart-Globig/p/book/9781926692692>

## ALLIED BOTANY PRACTICALS

### Learning Objectives

- To enhance information on the identification of each taxonomical group by developing the skill-based detection of the morphology and microstructure of microorganisms, algae, and fungi.
- To comprehend the fundamental concepts and methods used to identify Bryophytes, Pteridophytes and Gymnosperms through morphological changes and evolution, anatomy and reproduction.
- To be familiar with the basic concepts and principles of plant systematics.
- Understanding of laws of inheritance, genetic basis of loci and alleles.
- To learn about the physiological processes that underlie plant metabolism.

### EXPERIMENTS.

1. To describe in technical terms, plants belonging to any of the family prescribes and to identify the family.
2. To dissect a flower, construct floral diagram and write floral formula.
3. Demonstration experiments
  - i. Ganong's Light screen
  - ii. Ganong's respiroscope
4. To make suitable micro preparations of anatomy materials prescribed in the syllabus.
5. Spotters - Angiosperm anatomy and Embryology

### Recommended Texts

1. Sharma, O.P. 2017. Bryophyta, MacMillan India Ltd, New Delhi.
2. Sharma, O.P. 2012. Pteridophyta, Tata McGraw-Hills Ltd, New Delhi.
3. Subramaniam, N.S. 1996. Laboratory Manual of Plant Taxonomy. Vikas Publishing House Pvt. Ltd., New Delhi.



4. Benjamin, A. Pierce. 2012. Genetics- A conceptual Approach. W.H. Freeman and Company, New York, England.
5. Noggle G.R and G.J. Fritz. 2002. Introductory Plant Physiology. Prentice Hall of India, New Delhi.

#### Reference Books

1. Strickberger, M.W. 2005. Genetics (III Ed). Prentice Hall, New Delhi, India.
2. Nancy Serediak and M. Huynh. 2011. Algae identification lab Guide. Accompanying manual to algae identification field guide, Ottawa Agriculture and Agri food Canada publisher.
3. Mohammed Gufran Khan, Shite Gatew and Bedilu Bekele. 2012. Practical manual for Bryophytes and Pteridophytes. Lambert Academic Publishing.
4. Aler Gingauz. 2001. Medicinal Chemistry. Oxford University Press & Wiley Publications.
5. Steward, F.C. 2012. Plant Physiology Academic Press, US

#### Web sources

1. <https://www.amazon.in/Practical-Manual-Pteridophyta-RajanSundara/dp/8126106883>
2. <https://www.google.co.in/books/edition/Gymnosperms/3YrT5E3Erm8C?hl=en&gbp=1&dq=gymnosperms&printsec=frontcover>
3. <https://www.amazon.in/Computational-Phytochemistry-Satyajit-Dey-Sarker-ebook/dp/B07CV96NZJ>
4. <https://medlineplus.gov/genetocs/understanding/basics/cell/>
5. <https://apan.net/meetings/apan45/files/17/17-01-01-01.pdf>
6. [http://www.cuteri.eu/microbiologia/manuale\\_microbiologia\\_pratica.pdf](http://www.cuteri.eu/microbiologia/manuale_microbiologia_pratica.pdf)
7. <https://www.amazon.in/Manual-Practical-Bryophyta-Suresh-Kumar/dp/B0072GNFX4>

## BIOCOMPOSTING FOR ENTREPRENEURSHIP

### Learning Objectives:

- To highlight the importance of Biocomposting for entrepreneurship in waste management.
- To enable students for setting up Biocompost units and bins for waste reduction.

### Unit – I

Biocomposting – Definition, types and ecological importance.

### Unit – II

Types of Biocomposting technology – Field pits/ground heaps/ tank/large-scale/batch and continuous methods.

### Unit – III

Preparation of Biocompost pit and bed using different amendments.

### Unit – IV

Applications of Biocompost in soil fertility maintenance, promotion of plant growth, value added products, waste reduction, etc.



**Unit – V**

Economics of establishment of a small biocompost unit – project report proposal for Self Help Group (Income and employment generation).

**Practical**

1. Preparation procedures for Biocompost pit.
2. Selection of Biocompost material, separation of Compostable and Non-compostable materials.
3. Packing and marketing of Biocompost.
4. Field visit to Biocomposting unit.

**References**

1. Bikas R. Pati & Santi M. Mandal (2016). Recent trends in composting technology.
2. Van der Wurff, A.W.G., Fuchs, J.G., Raviv, M., Termorshuizen, A.J. (Editors) 2016. Handbook for Composting and Compost Use in Organic Horticulture. BioGreenhouse COST Action FA 1105, [www.biogreenhouse.org](http://www.biogreenhouse.org).

## **ANIMAL BEHAVIOUR**

**Learning Objectives**

- To learn the origin and development of animal behaviour and to understand the influence of genetics, environment on animal behaviours.
- To understand the biological properties of animal behavior, with an evolutionary and ecological emphasis.
- To Compare innate and learned behavior and differentiate between various mating system.
- To impart the knowledge about visual and auditory communication; courtship, mate choice, and mating systems; social behavior and social systems; and animal personality.
- To discuss how movement and migration behaviors are a result of natural selection.

**Unit I**

**Genetics and Behaviour:** Genetic material, Genes and chromosomes, Genetic variation, Single and Polygenic inheritance of behaviour, Heritability of behaviour, Natural selection and behaviour, Frequency distribution of phenotypes, Darwinian fitness, Evolution of adaptive strategies.

**Unit II**

**Evolution and Social Behaviour:** Sexual selection, Altruism, Sexual strategy and social organisation, Animal perception, Neural control of behaviour, Sensory processes and perception, Visual adaptations to unfavourable environments.

**Unit III**

**Animal and the Environment:** Coordination and Orientation, Homeostasis and Behaviour, Physiology and Behaviour in changing environments, Animal Learning,



Conditioning and Learning, Biological aspects of learning, Cognitive aspects of learning.

#### Unit IV

**Understanding Complex Behaviour:** Instinct and learning, Displacement activities, Ritualization and Communication, Decision making behaviour in Animals, Complex behaviour of honey bees, Evolutionary optimality, Mechanism of Decision making. The mentality of Animals : Languages and mental representation, non-verbal communication in human, mental images, Intelligence, tool use and culture, Animal awareness and Emotion.

#### Unit V

**Chronobiology:** Organization of circadian system in multicellular animals; Concept of central and peripheral clock system; Circadian pacemaker system in invertebrates with particular reference to *Drosophila*; Photoreception and phototransduction; The physiological clock and measurement of day length; Molecular bases of seasonality; The relevance of biological clocks for human welfare - Clock function (dysfunction); Human health and diseases - Chronopharmacology, chronomedicine, chronotherapy.

#### Text Books

1. David McFarland, 1985. *Animal Behaviour*, Longman Scientific & Technical, UK. 576pp.
2. Harjindra Singh, 1990. *A Text Book of Animal Behaviour*, Anomol Publication, 293p.
3. Hoshang S. Gunde via and Hare Govind Singh, 1996. *Animal Behaviour*, S. Chand & Co, 280pp.
4. Shukla, J. P 2010, *Fundamentals of Animal Behaviour*, Atlantic, 587pp.
5. Vinod Kumar, 2002. *Biological Rhythms*. Narosa Publishing House, Delhi.

#### Suggested Readings

1. Michael D. Breed and Janice Moore, 2012. *Animal Behaviour*, Academic Press, USA, 359pp.
2. Aubrey Manning and Martin Stamp Dawkins, 2012. *An Introduction to Animal Behaviour*, 6th Edition, Cambridge University Press, UK. 458pp.
3. Davis E. Davis, 1970. *Integral Animal Behaviour*, Mac Millan Company, London, 118pp.
4. Jay, C. Dunlap, Jennifer, J. Loros, Patricia J. De Coursey (ed). 2004. *Chronobiology Biological time Keeping*, Sinauer Associates Inc, Publishers, Sunderland, MA.

#### Web Resources

1. <https://www.ncbs.res.in/content/animal-behaviour>
2. <https://bit.ly/3i6wUxR>
3. <https://www.behaviour.univie.ac.at/>
4. <https://www.ru.nl/bsi/>

