



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-I				
Part	Subject Status	Subject Title	Subject Code	Credit
I	LANGUAGE	TAMIL/ MALAYALAM/ HINDI		3
II	LANGUAGE	ENGLISH		3
III	CORE	INVERTEBRATA		5
III	CORE LAB COURSE	LAB ON INVERTEBRATA		3
III	ELECTIVE I	ALLIED BOTANY I		3
	ELECTIVE I	LAB ON ALLIED BOTANY I		2
IV	SKILL ENHANCEMENT COURSE SEC-1 (NME)	ORNAMENTAL FISH FARMING AND MANAGEMENT		2
IV	FOUNDATION COURSE	INTRODUCTION TO ZOOLOGY		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 ≥ 6.0
- Second Class : CGPA ≥ 5.0 and < 6.0
- Third Class : CGPA < 5.0



பொதுத்தமிழ் - 1

Unit 1 - மரபுக் கவிதை

1. பெ. சுந்தரனார் - தமிழ்த் தெய்வ வணக்கம்
2. பாரதிதாசன் - சிறுத்தையே வெளியில் வா
3. கவிமணி - புத்தரும் சிறுவனும்
4. முடியரசன்-மொழி உணர்ச்சி
5. கண்ணதாசன் - ஆட்டனத்தி ஆதிமந்தி - ஆதிமந்தி புலம்பல்
6. சுரதா - துறைமுகம் தொகுப்புலிருந்து ஏதேனும் ஒரு கவிதை
7. தமிழ் ஒளி - கடல்

Unit II - புதுக்கவிதை

1. அப்துல் ரகுமான் - வீட்டுக்கொரு மரம் வளர்ப்போம்
2. ஈரோடு தமிழன்பன் - சென்றியூ கவிதைகள் (ஏதேனும் ஐந்து கவிதைகள்)
3. வைரமுத்து - பிற்சேர்க்கை
4. மு.மேத்தா - வாழைமரம்
5. அறிவுமதி - வள்ளுவம் பத்து
6. நா. முத்துக்குமார் - ஆனந்த யாழை மீட்டுகிறாய்
7. சுகிர்தராணி - சபிக்கப்பட்ட முத்தம்
8. இளம்பிறை - நீ எழுத மறுக்கும் எனது அழகு

Unit III - சிறுகதைகள்

1. வாய் சொற்கள் - ஜெயகாந்தன் (மாலை மயக்கம் தொகுப்பு)
2. கடிதம் - புதுமைப்பித்தன்
3. கரு - உமாமகேஸ்வரி
4. முன்முடி - தி ஜானகிராமன்
5. சிதறல்கள் - விழி.பா.இதயவேந்தன்
6. காகித உறவு - சு. சமுத்திரம்
7. வீட்டின் மூலையில் சமையல் அறை - அம்பை
8. (மொழிபெயர்ப்புக் கதை) ஆண்டவன் செக்காவ் - நாயக்காரய்ச் சீமாட்டி, சந்தியா பதிப்பகம்

Unit IV - பாடம் சார்ந்த இலக்கிய வரலாறு

Unit V - மொழித்திறன் போட்டி தேர்வு

1. பொருள் பொதிந்த சொற்றோடர் அமைத்தல்
2. ஓர் எழுத்து ஒரு மொழி
3. வேற்றுமை உருபுகள்
4. திணை, பால், எண், இடம்
5. கலைச்சொல்லாக்கம், மொழிபெயர்ப்பு

(குறிப்பு: அலகு 4,5 ஆகியன போட்டித் தேர்வு நோக்கில் நடத்தப்பட வேண்டும்)



MALAYALAM – I

PROSE, COMPOSITION AND TRANSLATION

Unit I

This unit focuses on Translation: Word level and syntactic level and also discuss the writing style of Essay. It introduces the proverbs, paraphrasing in Malayalam

Unit II

This unit briefs the importance of Nalukettu in the history of Malayalam literature. The following unit examines the characteristics of the novel chapter ways. Chapter First to 10

Unit III

Remaining Chapters are introduced and discussed.

Unit IV This unit focuses on Marappavakalum Mattu Kadhakalum by Karur. It also introduces the story

- Story 1 Marappavakal- Discussion
- Story II Uthuppante Kirnar
- Story III Kalchakaram
- Story IV Poovamabhazham
- Story V Vallakkaran
- Story VI Chekuthan
- Story VII Mothiram
- Unit V Story VIII Safety Pin
- Story IX Aranhaanam
- Story X Kuta nannakkaanuntoo
- Story XI Chudala thengu
- Story XII Ampala parmbil
- Story XIII Ezhunnallathu Duty
- Story XIV Pisachinte Kuppayam

Reading List (Print and Online)

1. Malayala Sahithya Charithram – Dr. K.M.George (Ed.)
2. Cherukadha Innale Innu - M.Achuthan
3. Kadha Thedunna Kadha - N.Prabhakaran
4. M.T. Vakkinte Vismayam – V.R.Sudheesh
5. Kadhayum Kalavum –K.S.Ravikumar
6. Malayala Novalilee Desakaalangal- E. Ramkrishnan
7. Maranunna Malayala Noval- K.P. Appan
8. Andhanaya Daivam- P.K.Rajasekharan
9. Shyalee shilppam- Dr.K.M. Prabhakra Varir
10. Bhasha gadhyam- C.V. Vasudeva Bhattathiri
11. Karur Kadha patanam- M.M.Basheer

Recommended Texts

1. NALUKKETTU (NOVEL) : M.T. VASUDEVAN NAIR
2. MARAPPAVAKALUM MATTU KADHAKALUM (SHORT STORIES): KAROOR



HINDI I

Unit I

Buniyadi Hindi

- Swar
- Vyanjan
- Barah Khadi
- Shabd aur
- Vakya Rachna

Unit II

Hindi Shabdavali

- Rishto ke Naam
- Gharelu padartho ke Naam

Unit III

Vyakaran

- Sadharan Vakya aur Sangya
- Sarvanam
- Visheshan
- Kriya aadi shabdo ka prayog

Unit IV

Chote Gadyansh ka Pathan

- Bacho ki Kahaniya
- Patra-Patrikao mein prakashit Gadyansho ka Pathan

Unit V

Nibandh

- Sant Tiruvalluvar
- E.V.R Thandai Periyar
- Naari Sashaktikaran
- Paryavaran Sanrakshan
- Vibhinna pratiyogi parikshao ke bare mein jaankari dena

Pratiyogi priksa par adharit nibandho dwara bhasha ki kshamta badhane vale prashikshan kary.

Reference Books

1. Hindi ke Avyay Vakyansh – Chaturbhuj Sahay
2. Subodh Hindi Vyakaran – Phoolchand Jain
3. Sankshipt Hindi Vyakaran – Kamta Prasad
4. Vyavaharik Hindi – Nagappa
5. Abhinav Hindi Vyakaran – Nagappa
6. Saral Hindi Vyakaran – Shyamchandra Kapur
7. Vyakaran Pradeep – Ramdev
8. Laghu Bal Kathaye – Ramashankar



9. Manoranjak Kahaniya – Premchand

10. CONCISE GRAMMAR OF THE HINDI LANGUAGE - H.C Scholberg

11. Hindi Grammar – Edwin Greaves

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

1. [fr#oYyqoj%](https://bharatdiscovery.org/india/%E0%A4%A4%E0%A4%BF%E0%A4%B0%E0%A5%81%E0%A4%B5%E0%A4%B2%E0%A5%8D%E0%A4%B2%E0%A5%81%E0%A4%B5%E0%A4%B0#:~:text=%E0%A4%A4%E0%A4%BF%E0%A4%B0%E0%A5%81%E0%A4%B5%E0%A4%B2%E0%A5%8D%E0%A4%B2%E0%A5%81%E0%A4%B5%E0%A4%B0%20(%E0%A4%85%E0%A4%82%E0%A4%97%E0%A5%8D%E0%A4%B0%E0%A5%87%E0%A4%9C%E0%A4%BC%E0%A5%80%3A%20Thiruvalluvar)%20%E0%A4%A6%E0%A4%95%E0%A5%8D%E0%A4%B7%E0%A4%BF%E0%A4%A3,%E0%A4%AA%E0%A4%BF%E0%A4%A4%E0%A4%BE%20%E0%A4%AE%E0%A5%87%E0%A4%82%20%E0%A4%B5%E0%A4%BF%E0%A4%B6%E0%A5%8D%E0%A4%B5%E0%A4%BE%E0%A4%B8%20%E0%A4%B0%E0%A4%96%E0%A4%A4%E0%A5%87%20%E0%A4%A5%E0%A5%87%E0%A5%A4)

[https://bharatdiscovery.org/india/%E0%A4%A4%E0%A4%BF%E0%A4%B0%E0%A5%81%E0%A4%B5%E0%A4%B2%E0%A5%8D%E0%A4%B2%E0%A5%81%E0%A4%B5%E0%A4%B0#:~:text=%E0%A4%A4%E0%A4%BF%E0%A4%B0%E0%A5%81%E0%A4%B5%E0%A4%B2%E0%A5%8D%E0%A4%B2%E0%A5%81%E0%A4%B5%E0%A4%B0%20\(%E0%A4%85%E0%A4%82%E0%A4%97%E0%A5%8D%E0%A4%B0%E0%A5%87%E0%A4%9C%E0%A4%BC%E0%A5%80%3A%20Thiruvalluvar\)%20%E0%A4%A6%E0%A4%95%E0%A5%8D%E0%A4%B7%E0%A4%BF%E0%A4%A3,%E0%A4%AA%E0%A4%BF%E0%A4%A4%E0%A4%BE%20%E0%A4%AE%E0%A5%87%E0%A4%82%20%E0%A4%B5%E0%A4%BF%E0%A4%B6%E0%A5%8D%E0%A4%B5%E0%A4%BE%E0%A4%B8%20%E0%A4%B0%E0%A4%96%E0%A4%A4%E0%A5%87%20%E0%A4%A5%E0%A5%87%E0%A5%A4](https://bharatdiscovery.org/india/%E0%A4%A4%E0%A4%BF%E0%A4%B0%E0%A5%81%E0%A4%B5%E0%A4%B2%E0%A5%8D%E0%A4%B2%E0%A5%81%E0%A4%B5%E0%A4%B0#:~:text=%E0%A4%A4%E0%A4%BF%E0%A4%B0%E0%A5%81%E0%A4%B5%E0%A4%B2%E0%A5%8D%E0%A4%B2%E0%A5%81%E0%A4%B5%E0%A4%B0%20(%E0%A4%85%E0%A4%82%E0%A4%97%E0%A5%8D%E0%A4%B0%E0%A5%87%E0%A4%9C%E0%A4%BC%E0%A5%80%3A%20Thiruvalluvar)%20%E0%A4%A6%E0%A4%95%E0%A5%8D%E0%A4%B7%E0%A4%BF%E0%A4%A3,%E0%A4%AA%E0%A4%BF%E0%A4%A4%E0%A4%BE%20%E0%A4%AE%E0%A5%87%E0%A4%82%20%E0%A4%B5%E0%A4%BF%E0%A4%B6%E0%A5%8D%E0%A4%B5%E0%A4%BE%E0%A4%B8%20%E0%A4%B0%E0%A4%96%E0%A4%A4%E0%A5%87%20%E0%A4%A5%E0%A5%87%E0%A5%A4)

2. [bZ-os-jkelkeh](https://hi.wikipedia.org/wiki/%E0%A4%AA%E0%A5%87%E0%A4%B0%E0%A4%BF%E0%A4%AF%E0%A4%BE%E0%A4%B0#:~:text=%E0%A4%87%E0%A4%B0%E0%A5%8B%E0%A4%A1%20%E0%A4%B5%E0%A5%87%E0%A4%82%E0%A4%95%E0%A4%9F%20%E0%A4%A8%E0%A4%BE%E0%A4%AF%E0%A4%95%E0%A4%B0%20%E0%A4%B0%E0%A4%BE%E0%A4%AE%E0%A4%BE%E0%A4%B8%E0%A4%BE%E0%A4%AE%E0%A5%80%20(17,%E0%A4%B5%E0%A4%BE%E0%A4%B2%E0%A5%87%20%E0%A4%B9%E0%A4%BF%E0%A4%A8%E0%A5%8D%E0%A4%A6%E0%A5%81%E0%A4%A4%E0%A5%8D%E0%A4%B5%20%E0%A4%95%E0%A4%BE%20%E0%A4%B5%E0%A4%BF%E0%A4%B0%E0%A5%8B%E0%A4%A7%20%E0%A4%A5%E0%A4%BE%E0%A5%A4)

[https://hi.wikipedia.org/wiki/%E0%A4%AA%E0%A5%87%E0%A4%B0%E0%A4%BF%E0%A4%AF%E0%A4%BE%E0%A4%B0#:~:text=%E0%A4%87%E0%A4%B0%E0%A5%8B%E0%A4%A1%20%E0%A4%B5%E0%A5%87%E0%A4%82%E0%A4%95%E0%A4%9F%20%E0%A4%A8%E0%A4%BE%E0%A4%AF%E0%A4%95%E0%A4%B0%20%E0%A4%B0%E0%A4%BE%E0%A4%AE%E0%A4%BE%E0%A4%B8%E0%A4%BE%E0%A4%AE%E0%A5%80%20\(17,%E0%A4%B5%E0%A4%BE%E0%A4%B2%E0%A5%87%20%E0%A4%B9%E0%A4%BF%E0%A4%A8%E0%A5%8D%E0%A4%A6%E0%A5%81%E0%A4%A4%E0%A5%8D%E0%A4%B5%20%E0%A4%95%E0%A4%BE%20%E0%A4%B5%E0%A4%BF%E0%A4%B0%E0%A5%8B%E0%A4%A7%20%E0%A4%A5%E0%A4%BE%E0%A5%A4](https://hi.wikipedia.org/wiki/%E0%A4%AA%E0%A5%87%E0%A4%B0%E0%A4%BF%E0%A4%AF%E0%A4%BE%E0%A4%B0#:~:text=%E0%A4%87%E0%A4%B0%E0%A5%8B%E0%A4%A1%20%E0%A4%B5%E0%A5%87%E0%A4%82%E0%A4%95%E0%A4%9F%20%E0%A4%A8%E0%A4%BE%E0%A4%AF%E0%A4%95%E0%A4%B0%20%E0%A4%B0%E0%A4%BE%E0%A4%AE%E0%A4%BE%E0%A4%B8%E0%A4%BE%E0%A4%AE%E0%A5%80%20(17,%E0%A4%B5%E0%A4%BE%E0%A4%B2%E0%A5%87%20%E0%A4%B9%E0%A4%BF%E0%A4%A8%E0%A5%8D%E0%A4%A6%E0%A5%81%E0%A4%A4%E0%A5%8D%E0%A4%B5%20%E0%A4%95%E0%A4%BE%20%E0%A4%B5%E0%A4%BF%E0%A4%B0%E0%A5%8B%E0%A4%A7%20%E0%A4%A5%E0%A4%BE%E0%A5%A4)

3. [ukjh l'kfDrdj.k%](https://www.hindikiduniya.com/essay/women-empowerment-essay-inhindi/#:~:text=%E0%A4%AE%E0%A4%B9%E0%A4%BF%E0%A4%B2%E0%A4%BE%20%E0%A4%B8%E0%A4%B6%E0%A4%95%E0%A5%8D%E0%A4%A4%E0%A4%BF%E0%A4%95%E0%A4%B0%E0%A4%A3%20%E0%A4%95%E0%A5%8D%E0%A4%AF%E0%A4%BE%20)

<https://www.hindikiduniya.com/essay/women-empowerment-essay-inhindi/#:~:>

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4. i;kZoj.k laj{k.k%

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- a. https://hi.wikipedia.org/wiki/%E0%A4%AA%E0%A4%B0%E0%A5%8D%E0%A4%AF%E0%A4%BE%E0%A4%B5%E0%A4%B0%E0%A4%A3_%E0%A4%B8%E0%A4%88%E0%A4%B0%E0%A4%95%E0%A5%8D%E0%A4%B7%E0%A4%A3#:~:text=%E0%A4%AA%E0%A4%B0%E0%A5%8D%E0%A4%AF%E0%A4%BE%E0%A4%B5%E0%A4%B0%E0%A4%A3%20%E0%A4%B8%E0%A4%82%E0%A4%B0%E0%A4%95%E0%A5%8D%E0%A4%B7%E0%A4%A3%20%E0%A4%95%E0%A4%BE%20%E0%A4%B8%E0%A4%AE%E0%A4%B8%E0%A5%8D%E0%A4%A4%20%E0%A4%AA%E0%A5%8D%E0%A4%B0%E0%A4%BE%E0%A4%A3%E0%A4%BF%E0%A4%AF%E0%A5%8B%E0%A4%82,%E0%A4%AA%E0%A5%83%E0%A4%A5%E0%A5%8D%E0%A4%B5%E0%A5%80%20%E0%A4%B8%E0%A4%AE%E0%A5%8D%E0%A4%AE%E0%A5%87%E0%A4%B2%E0%A4%A8'%20%E0%A4%86%E0%A4%AF%E0%A5%8B%E0%A4%9C%E0%A4%BF%E0%A4%A4%20%E0%A4%95%E0%A4%BF%E0%A4%AF%E0%A4%BE%20%E0%A4%97%E0%A4%AF%E0%A4%BE%E0%A5%A4
- b. http://gadyakosh.org/gk/%E0%A4%86%E0%A4%88%E0%A4%AF%E0%A5%87!_%E0%A4%AA%E0%A4%B0%E0%A5%8D%E0%A4%AF%E0%A4%BE%E0%A4%B5%E0%A4%B0%E0%A4%A3_%E0%A4%AC%E0%A4%9A%E0%A4%BE%E0%A4%8F%E0%A4%81/_/_E0%A4%85%E0%A4%A8%E0%A5%8D%E0%A4%A4%E0%A4%B0%E0%A4%BE_%E0



PART II ENGLISH

Unit 1- Poetry

- 1.1 A Patch of Land - Subramania Bharati
- 1.2 The Sparrow - Paul Laurence Dunbar
- 1.3 A Nation's Strength – Ralph Waldo Emerson
- 1.4 Love Cycle - Chinua Achebe

Unit II - Prose

- 1 JRD - Harish Bhat
- 2 Us and Them - David Sedaris From Dress Your Family in Corduroy and Denim
- 3 Uncle Podger Hangs a Picture - Jerome K Jerome

Unit III- Short Stories

- 1 The Faltering Pendulum- Bhabani Bhattacharya
- 2 How I Taught my Grandmother to Read- Sudha Murthy
- 3 The Gold Frame- R.K. Laxman

Unit IV - Language Competency

- 1 Vocabulary : Synonyms, Antonyms, Word Formation
- 2 Appropriate use of Articles and Parts of Speech
- 3 Error correction

Unit V English for Workplace

- 1 Self - introduction, Greetings
- 2 Introducing others
- 3 Listening for General and Specific Information
- 4 Listening to and Giving Instructions /Directions

Text books (Latest Editions)

1. Steel Hawk and other stories by Bhattacharya, Bhabani, New Delhi: Sahitya Akademi, 1967
2. How I taught my Grandmother to Read and other Stories, Murthy, Sudha, Penguin Books, India, 2004

Web Resources

1. A patch of land by Subramania Bharati translated by Usha Rajagoplan : https://books.google.co.in/books?id=iSHvOmXuvLMC&printsec=frontcover&dq=subramania+bharati+poems&hl=en&newbks=1&newbks_redir=0&source=



gb_mobile_search&sa=X&redir_esc=y#v=onepage&q=subramania%20bharati%20poems&f=false

2. The Sparrow by Paul Laurence Dunbar <https://poets.org/poem/sparrow-0>
3. A Nation's Strength by Emerson <https://poets.org/poem/nations-strength>
4. Love cycle by Chinua Achebe : <https://www.best-poems.net/chinuaachebe/love-cycle.html>
5. JRD by Harish Bhat <https://www.tata.com/newsroom/heritage/coffee-tea-jrd-tata-stories>
6. Us and Them by David Sedaris From Dress Your Family in Corduroy and Denim <https://legacy.npr.org/programs/morning/features/2004/jun/sedaris/usandthem.html>
7. Uncle Podger Hangs a Picture:
<http://rosyhunt.blogspot.com/2013/01/unclepodger-hangs-picture.html>
8. The Gold Frame: <https://fybaenglish.blogspot.com/2018/12/the-gold-frame-r-k-laxman.html>

Reference Books

(Latest Editions, and the style given must be strictly adhered to)

1. English in use - A textbook for College Students (English ,Paper back, - T.Vijay Kumar, KDurga Bhavani, YL Srinivas
2. 2 Practical English Usage - 4th Edition By Michael Swan
3. The Art of Civilized Conversation: A Guide to Expressing Yourself with Style and
4. Grace -Margaret Shepherd, Penny Carter, (Illustrator), Sharon Hogan, 2005.



INVERTEBRATA I

Course Code CC1	Course Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	INVERTEBRATA I	Core	Y	-	-	-	5	5	25	75	100
Learning Objectives											
CO1	To understand the basic concepts of lower animals and observe the structure and functions.										
CO2	To illustrate and examine the systemic and functional morphology of various group of invertebrates.										
CO3	To differentiate and classify the various groups of animal modes of life and to estimate the biodiversity.										
CO4	To compare and distinguish the general and specific characteristics of reproduction in lower animals.										
CO5	To infer and integrate the parasitic and economic importance of invertebrate animals										
UNIT	Details										
I	Protozoa: Introduction to Classification, taxonomy and nomenclature. General characters and classification of Phylum Protozoa up to classes. Type study - <i>Paramecium</i> and <i>Plasmodium</i> - Parasitic protozoans (<i>Entamoeba</i>, <i>Trypanasoma</i> & <i>Leishmania</i>) - Economic importance Nutrition in protozoa - Host-parasitic interactions in <i>Entamoeba</i> and <i>Plasmodium</i>-Locomotion in protozoa Porifera: General characters and classification up to Classes. Type study - Sycon - Canal system in sponges - Reproduction in sponges.										
II	Coelenterata : General characters and classification up to classes – Type study - <i>Obelia</i> - Corals and coral reefs - Economic importance - Mesenteries in Anthozoa - Economic importance of corals and coral reefs - Polymorphism in Hydrozoa. Platyhelminthes: General characters and classification of up to classes. Type study – <i>Fasciola hepatica</i>. Parasitic adaptations. Host- parasitic interactions of Helminthine parasites.										
III	Aschelminthes : General characters and classification of up to classes - Type study - <i>Ascaris lumbricoides</i>. Nematode Parasites and diseases - <i>Wuchereria bancrofti</i>, <i>Enterobius vermicularis</i>, <i>Ancylostome duodenale</i>. Parasitic adaptations. Annelida: General characters and classification up to Classes. Type study –<i>Nereis</i>, Metamerism - Modes of life in Annelids.										



IV	Arthropoda: General characters and classification of Phylum Arthropoda up to Classes. Type study: <i>Penaeus indicus</i> . Affinities of <i>Peripatus</i> – Larval forms in Crustacea. Economic importance of Insects. Insect pests of Agricultural Importance- Pest of rice: Rice stem borer (<i>Scirpophaga incertulas</i>) – Pest of Sugarcane: The shoot borer (<i>Chilo infuscatellus</i>) – Pest of coconut: The rhinoceros beetle (<i>Oryctes rhinoceros</i>). Principles of Integrated Pest Management.
V	Mollusca: General characters and classification of Phylum Mollusca up to Classes. Type study: <i>Pila globosa</i> . Foot and torsion in Mollusca. Economic importance- Cephalopods Echinodermata: General characters and classification of Phylum Echinodermata up to Classes. Type study: <i>Asterias</i> . Water Vascular system in Echinodermata – Larval forms of Echinoderms.
Text Books (Latest Editions)	
1.	Ekambaranatha Iyer, 2000. A Manual of Zoology, 10 th edition, Viswanathan, S., Printers & Publishers Pvt Ltd
2.	Jordan, E.L. and Verma P.S, 1995. Invertebrate Zoology, 12 th edn. S. Chand & Co
3.	Kotpal, R.L, 1992. Protozoa, Porifera, Coelenterata, Annelida, Arthropoda.
References Books (Latest editions, and the style as given below must be strictly adhered to)	
1.	Ruppert and Barnes, R.D. (2006). Invertebrate Zoology, VIII Edition. Holt Saunders International Edition.
2.	Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). The Invertebrates: A New Synthesis, III Edition, Blackwell Science
3.	Barrington, E.J.W. (1979). Invertebrate Structure and Functions. II Edition, E.L.B.S. and Nelson
4.	Hyman L.H, 1955. The invertebrates - Vol. I to Vol. VII – Mc Graw Hill Book Co.
5.	Parker, J. and Haswell, 1978. A text book of Zoology Vol. I - Williams and Williams.
Web Resources	
1.	https://www.nationalgeographic.com/animals/invertebrates/
2.	https://bit.ly/3kABzKa
3.	https://www.nio.org/
4.	https://greatbarrierreef.org/



INVERTEBRATA LAB COURSE

Course Code	Course Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	INVERTEBRATA LAB COURSE	Core	Y	-	-	-	3	3	50	50	100
Learning Objectives											
CO1	To identify the different groups of invertebrate animals by observing their external characteristics.										
CO2	To understand the organs, organ system and their functions in lower animals.										
CO3	To get knowledge about the different modes of life and their adaptation based on the environment.										
CO4	Able to dissect and display the internal organs and mount the mouthparts and scales of invertebrates.										
UNIT	Details										
I	Major Dissection : Cockroach: Nervous system, Reproductive system.										
II	Minor Dissection: Cockroach: Digestive system.										
III	Mounting: Cockroach: Mouth parts - Honey Bee/ House fly/ Mosquito. Prawn: Appendages										
IV	Record / Observation Note (SUBMISSION IS MANDATORY)										
V	Spotters : (i). Protozoa: Amoeba, Paramecium, Paramecium Binary fission and Conjugation, Entamoeba histolytica, Plasmodium vivax (ii). Porifera: Sycon, Gemmule (iii). Coelenterata: Obelia – Colony & Medusa, Aurelia, Physalia, Gorgonia, (iv). Platyhelminthes: Planaria, Fasciola hepatica, Fasciola larval forms – Miracidium, Redia, Cercaria, Taenia solium, (v). Nematelminthes: Ascaris (Male & Female), vi). Annelida: Nereis, Chaetopteurs, Hirudinaria, Trochophore larva (vii). Arthropoda: Cancer, Palaemon, Scorpion, Scolopendra, Sacculina, Limulus, Peripatus, Larvae - Nauplius, Mysis, Zoea,. (viii). Mollusca: Chiton, Pila, Unio, Pteredo, Murex, Sepia, Loligo, Octopus, (ix). Echinodermata: Asterias, Ophiothrix, Cucumaria, Antedon, Bipinnaria larva										
Text Books (Latest Editions)											
1.	Ekambaranatha Iyyar and T. N. Ananthakrishnan, 1995 A manual of Zoology Vol.I (Part 1, 2) S. Viswanathan, Chennai										



2.	Ganguly, Sinha and Adhikari, 2011. Biology of Animals: Volume I, New Central Book Agency; 3rd revised edition. 1008 pp.
3.	Sinha, Chatterjee and Chattopadhyay, 2014. Advanced Practical Zoology, Books & Allied Ltd; 3rd Revised edition, 1070 pp.
4.	Lal, S. S., 2016. Practical Zoology Invertebrate, Rastogi Publications.
5.	Verma, P. S. 2010. A Manual of Practical Zoology: Invertebrates, S Chand, 497pp.
References Books (Latest editions, and the style as given below must be strictly adhered to)	
1.	Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). <i>The Invertebrates: A New Synthesis</i> , III Edition, Blackwell Science.
2.	Barnes, R.D. (1982). <i>Invertebrate Zoology</i> , V Edition. Holt Saunders International Edition.
3.	Barrington, E.J.W. (1979). <i>Invertebrate Structure and Functions</i> . II Edition, E.L.B.S. and Nelson
4.	Boradale, L.A. and Potts, E.A. (1961). <i>Invertebrates: A Manual for the use of Students</i> . Asia Publishing Home.
5.	Lal, S.S. 2005. A text Book of Practical Zoology: Invertebrate, Rastogi, Meerut
Web Resources	
1.	https://nbb.gov.in/
2.	http://www.agshoney.com/training.htm
3.	https://icar.org.in/
4.	http://www.csrtimys.res.in/
5.	http://csb.gov.in/
6.	https://iinrg.icar.gov.in/
7.	https://www.nationalgeographic.com/animals/invertebrates/



ELECTIVE ALLIED BOTANY-I

Title of the Course		ALLIED BOTANY-I
Pre-requisite		To study the basics of botany.
Learning Objectives		
C1	To study morphological and anatomical adaptations of plants of various habitats.	
C2	To demonstrate techniques of plant tissue culture.	
C3	To familiarize with the structure of DNA, RNA.	
C4	To carryout experiments related with plant physiology.	
C5	To perform biochemistry experiments.	
UNIT	CONTENTS	
I	Algae: General characters of algae - Structure, reproduction and life cycle of the following genera - <i>Anabaena</i> and <i>Sargassum</i> and economic importance of algae.	
II	Fungi, Bacteria and Virus: General characters of fungi, structure, reproduction and life cycle of the following genera - <i>Penicillium</i> and <i>Agaricus</i> and economic importance of fungi. Bacteria - general characters, structure and reproduction of <i>Escherichia coli</i> and economic importance of bacteria. Virus - general characters, structure of TMV, structure of bacteriophage.	
III	Bryophytes, Pteridophytes and Gymnosperms: General characters of Bryophytes, Structure and life cycle of <i>Funaria</i> . General characters of Pteridophytes, Structure and life cycle of <i>Lycopodium</i> . General characters of Gymnosperms, Structure and life cycle of <i>Cycas</i> .	
IV	Cell Biology: Prokaryotic and Eukaryotic cell- structure /organization. Cell organelles - ultra structure and function of chloroplast, mitochondria and nucleus. Cell division - mitosis and meiosis.	
V	Genetics and Plant Biotechnology: Mendelism - Law of dominance, Law of segregation, Incomplete dominance. Law of independent assortment. Monohybrid and dihybrid cross - Test cross - Back cross. Plant tissue culture - <i>In vitro</i> culture methods. Plant tissue culture and its application in biotechnology.	
Recommended Texts	1. Singh, V., Pande, P.C and Jain, D.K. 2021. A Text Book of Botany. Rastogi Publications, Meerut. 2. Bhatnagar, S.P and Alok Moitra. 2020. Gymnosperms, New Age International (P) Ltd., Publishers, Bengaluru. 3. Sharma, O.P. 2017. Bryophyta, MacMillan India Ltd. Delhi. 4. Lee, R.E. 2008. Phycology, IV Edition, Cambridge University Press, New Delhi. 5. Rao, K., Krishnamurthy, K.V and Rao, G.S. 1979. Ancillary Botany, S. Viswanathan Pvt. Ltd., Madras.	



Reference books:	1. Parihar, N.S. 2012. An introduction to Embryophyta –Pteridophytes - Surjeet Publications, Delhi. 2. Alexopoulos, C.J. 2013. Introduction to Mycology. Willey Eastern Pvt. Ltd. 3. Vashishta, P.C. 2014. Botany for Degree Students Gymnosperms. Chand & Company Ltd, Delhi. 4. Coulter, M. Jhon, 2014. Morphology of Gymnosperms. Surjeet Publications, Delhi. 5. Vashishta, P.C. 2014. Botany for Degree Students Algae. 2014. Chand & Company Ltd, Delhi. 6. Parihar, N.S. 2013. An introduction to Embryophyta –Bryophytes -, Surjeet Publications, Delhi. 7. Pandey B.P. 1986, Text Book of Botany (College Botany) Vol I &II, S.Chand and Co. New Delhi.
Web Resources	1. https://www.kobo.com/us/en/ebook/the-algae-world 2. http://www.freebookcentre.net/biology-books-download/Fungi-(PDF-15P).html 3. http://scitec.uwichill.edu.bb/bcs/bl14apl/bryo1.htm 4. https://www.toppr.com/guides/biology/plant-kingdom/pteridophytes/ 5. https://arboretum.harvard.edu/wp-content/uploads/2013-70-4-beyond-pine-cones-an-introduction-to-gymnosperms.pdf 6. https://www.us.elsevierhealth.com/medicine/cell-biology 7. https://www.us.elsevierhealth.com/medicine/genetics 8. https://www.kobo.com/us/en/ebook/plant-biotechnology-1

ELECTIVE ALLIED BOTANY PRACTICALS

EXPERIMENTS

1. Make suitable micro preparation of the types prescribed in Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms.
2. Micro photographs of the cell organelles ultra structure.
3. Simple genetic problems.
4. Spotters - Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms, Cell biology and Biotechnology.

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 Sereadiak 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-Rajan-Sundara/dp/8126106883>
2. <https://www.google.co.in/books/edition/Gymnosperms/3YrT5E3Erm8C?hl=en&gbpv=1&dq=gymnosperms&printsec=frontcover>
3. <https://www.amazon.in/Computational-Phytochemistry-Satyajit-Dey-SarkerB/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
7. <https://www.amazon.in/Manual-Practical-Bryophyta-Suresh-Kumar/dp/B0072GNFX4>



Ornamental Fish Farming & Management

Learning Objectives:

- To highlight the importance of ornamental fish culture in relation to entrepreneurship development.
- To enable the identification, culture and maintenance of commercially important ornamental fishes.
- To provide the knowledge on the techniques of ornamental fish breeding, rearing, disease control and economics of ornamental fish farming.

Unit I:

Introduction to ornamental fish keeping.

Scope and importance of ornamental fish culture.

Domestic and global scenario of ornamental fish trade and export potential.

Commercially important ornamental fishes - Indigenous and exotic varieties.

Unit II:

Biology of egg layers and live bearers.

Food and feeding in ornamental fishes. Formulated feed and Live feed; Live feed culture.

Breeding, hatchery and nursery management of egg layers (eg. Goldfish) and live bearers (eg. Guppy).

Unit III:

Aquarium design and construction; Accessories - aerators, filters and lighting.

Aquarium plants and their propagation.

Maintenance of aquarium and water quality management.

Ornamental fish diseases, their prevention, control and treatment methods.

Unit IV

Conditioning, packing, transport and quarantine methods.

Economics, trade regulations, domestic and export marketing strategies.

Practical

1) Identification of locally available ornamental fishes - Egg layers and live bearers.

2) Identification of locally available live feed organisms.

References:

1. Swain SK., Sarangi N. and Ayyappan S. 2010. Ornamental fish farming. ICAR, New Delhi.
2. Living Jewels – A handbook on freshwater ornamental fish, MPEDA, Kochi.
3. Dey V.K.A. 1997. A handbook on aquafarming ornamental fishes. MPEDA, Kochi.
4. Ahilan, B., Felix N. and Santhanam R. 2008. Text book of aquaculture. Daya Publishing House, New Delhi.

Web links:

1. <http://ecoursesonline.iasri.res.in/course/view.php?id=297>
2. <https://www.ofish.org/>
3. <https://krishijagran.com/agripedia/income-generation-by-ornamental-fish-culture/>
4. <https://99businessideas.com/ornamental-fish-farming/>

