



MANONMANIAM SUNDARANAR UNIVERISTY,  
TIRUNELVELI-12

## SYLLABUS

### UG - COURSES – AFFILIATED COLLEGES

Course Structure for B. Sc. Botany

(Choice Based Credit System)

(with effect from the academic year 2023-2024 onwards )



Semester-III				
Part	Subject Status	Subject Title	Subject Code	Credit
I	LANGUAGE	TAMIL/MALAYALAM/HINDI	E1TL31/ E1MY31/ E1HD31	3
II	ENGLISH	ENGLISH	E2EN31	3
III	CORE V	PLANT DIVERSITY III - BRYOPHYTES AND PTERIDOPHYTES	EMBO31	4
III	CORE VI	PLANT DIVERSITY III BRYOPHYTES AND PTERIDOPHYTES – PRACTICAL-III	EMBOP3	2
III	ELECTIVE	ALLIED: CHEMISTRY PAPER – I	EECH11	4
		ALLIED PRACTICAL	EECHP1	2
IV	SEC	HERBAL TECHNOLOGY	ESBO31	2
IV	EVS	ENVIRONMENTAL STUDIES	EEVS31	2
		NAAN MUTHALVAN		



**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)**

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

- **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

### தமிழக வரலாறும் பண்பாடும்

#### அலகு 1

**தொழில் பழங்கால வரலாறும் சங்ககால வரலாறும்**

1. தொழில் தமிழர்
2. பழைய கற்காலம்
3. புதிய கற்காலம்
4. உலோகக் காலம்
5. அகழ்வாராய்ச்சியில் தமிழும் தமிழரும் (கீழடி வரை)
6. திணை வாழ்வியல் (களவு வாழ்க்கை, கற்பு வாழ்க்கை, உணவு, அணிகலன்கள், வாணிகம், விளையாட்டுகள்)
7. கல்வியும் கலைகளும்
8. தமிழ் வளர்த்த சங்கம்
9. சங்க கால ஆட்சி முறை
10. அயல்நாட்டுத் தொடர்புகள்

#### அலகு 2

**ஆட்சியர் வரலாறு**

1. மூவேந்தர் வரலாறு
2. பல்லவர் வரலாறு
3. நாயக்கர் ஆட்சி
4. முகம்மதியர் ஆட்சி
5. மராட்டியர் ஆட்சி

#### அலகு 3

**ஐரோப்பியர் கால வரலாறு**

1. போர்த்துகீசியர்
2. டச்சுக்காரர்கள்
3. டேனிஸ்கரர்கள்
4. பிரெஞ்சுக்காரர்கள்
5. ஆங்கிலேயர்கள்
6. பாளையக்காரர்கள்
7. இந்தியா விடுதலை போராட்டத்தில் தமிழ்நாடு

#### அலகு 4

**விடுதலைக்கிபின் தமிழ்நாட்டு வரலாறு**

1. மொழிபோராட்டம்



2. சமூக மறுமலர்ச்சி
3. தொழில்நுட்ப வளர்ச்சி

#### அலகு 5

##### மொழிப்பயிற்சி

1. நிறுத்தக் குறிகள்
2. கலைச்சொற்கள்
3. மொழிபெயர்ப்பு

#### Text Books

- தமிழக வரலாறும் பண்பாடும் - கே. கே. பிள்ளை, உலகத் தமிழாராய்ச்சி நிறுவனம், சென்னை
- தமிழர் நாகரீகம் பண்பாடும் - அ. தட்சிணாமூர்த்தி, யாழ் வெளியீடு, சென்னை
- தமிழக வரலாறும் பண்பாடும்-வே.தி.செல்லம், மணிவாசகர் பதிப்பகம், சென்னை

#### Reference Books

1. தமிழக சமுதாயா பண்பாட்டு கலை வரலாறு - கு சேதுராமன், என்,சி,பி.எச், சென்னை
2. தமிழர் கலையும் பண்பாடும்-அ .கா.பெருமாள், என்,சி,பி.எச், சென்னை
3. ஒரு பண்பாட்டின் பயணம்: சிந்து முதல் வைகை வரை - ஆர். பாலகிருஷ்ணன், ரோஜா முத்தையா ஆராய்ச்சி நூலகம், சென்னை.



# MALAYALAM - POETRY

## UNIT I

This unit focus on significance of Malayalam Poetry and trends.

To familiarize the early stages of Malayalam poetry- Folklore heritage-Pattu-Bhakthi movement- Cherussery-Ezhutachan- Kunjan Nambiar-

Detailed study:

Jaritha Vilapam (Mahabharatam kilippattu) Ezhutachan

## UNIT II

Romanticism –Asan- Ulloor – Vallathol

Detailed study :

1. Veena Poovu (First 7 slokas only)- Asan
2. Aa poomala- Changampuzha

## UNIT III

Modernity in Malayalam poetry- First phase

Post Independent India and Modernization of Nation in Malayalam poetry

Detailed study

1. Yuga Parivarthanam- Vailoppilli Sreedhara Menon
2. Gandhiyum Godseyum- N .V.Krishna Warriar

## UNIT IV

Modernity in Malayalam poetry- second phase

Detailed Study

1. Gajendra moksham \_ Sugathakumari
2. Kozhi – Kadammanitta
3. Megharoopan – Aattoor Ravi Varma
4. Budhanum Attin kuttiyum – A. Ayyappan

## UNIT V

This unit introduces the nature of samakalika kavitha It also evaluates s a m a k a l i k a kavitha,- the contemporary poetry originated after modern poetry- women, Dalit, environment and cyber issues.

Detailed study

- 1.Pattanbipuzhamanalil – P P Ramachandran
- 2.Malayalakavithakku oru Kathu- S. Joseph
- 3.Thoramazha – Rafeek Ahammad
- 4.Muttamadikkumbol – Anitha Thampi
- 5.Survey of India-B.M.Manoj

## Recommended Text

Puthukavitha Ed by Dr.O.K.Santhosh.Madras University Publication (5 poems only )

- (a) pattambipuzhamanalil,
- (b) Malayala kavithakku oru kathu,
- (c) Muttamadikkumbol,
- (d) Thoramazha,
- (e) Survey of India

## Reading List (Print and Online)

1. Aadhunika Malayala Sahitya Charithram prasthanangaliloode – Dr. K.M.George (Ed.)
2. Kairaliyute Kadha – N.Krishnapillai
3. Kavitha Sahitya Charithram – M.Leelavathi
4. Adrushyathayute Akhyanangal- Rajesh Chirapadu
5. Adhunikananthara Malayala Kavitha –C.R.Prasad
6. Pen kavitha malayalathil-Sheeba Divakaran,kerala bhasha institute.Thiruvananthapuram
7. Samakalika Malayala kavitha-M.B.Manoj,Samayam Classics. Kanoor
8. Varnnaraji Dr.M.Leelavathi



## **HINDI - Patra Lekhan aur Paribhashik Shabdawali**

### **Unit I**

#### **Niji Patra Lekhan**

- Niji Patra – Arth aur Bhed
- Pitaji/Mataji ke naam patra
- Mitra, Bhai aadi ke naam patra
- Paribhashik Shabdawali – 20 words

### **Unit II**

#### **Samajik Patra Lekhan**

- Samajik Patra – Arth aur Bhed
- Aavedan Patra – Noukri, Chutti aadi
- Dak Adhikari ke naam patra
- Paribhashik shabdawali – 20 words

### **Unit III**

#### **Vyavasayik Patra Lekhan**

- Vyavasayik Patra – Arth aur Bhed
- Prakashak ke naam patra
- Shikayathi
- Paribhashik shabdawali – 20 words

### **Unit IV**

- Samanya Parichay
- Sarkari Patra
- Ardh-Sarkari Patra
- Gyapan, Paripatra
- Anusmarak
- Paribhashik Shabdawali – 20 words

### **Unit V**

- Precis Writing And Applied Grammar (Ling, Vachan and Karak)

### **Reference Books**

1. Viyavaharik Hindi, Hindi Prachar press, T.Nagar, Madras-600 017
2. Alekhan aur Tippan – Prof. Viraj
3. Alekhan - Kichlu

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

1. <https://youtu.be/-kUPGG0B4tU>
2. <https://www.youtube.com/watch?v=xk14MNb1r7k>



# GENERAL ENGLISH

## Unit I ACTIVE LISTENING

### Short Story

- 1.1 In a Grove – Akutagawa Ryunosuke Translated from Japanese by Takashi Kojima
- 1.2 The Gift of the Magi – O' Henry

### Prose

- 1.3 Listening – Robin Sharma
- 1.4 Nobel Prize Acceptance Speech – WangariMaathai

## Unit II INTERPERSONAL RELATIONSHIPS

### Prose

- 2.1 Telephone Conversation – Wole Soyinka
- 2.2 Of Friendship – Francis Bacon Song on (Motivational/ Narrative)
- 2.3 Ulysses – Alfred Lord Tennyson
- 2.4 And Still I Rise – Maya Angelou

## Unit III COPING WITH STRESS

### Poem

- 3.1 Leisure – W.H. Davies
- 3.2 Anxiety Monster – RhonaMcFerran

### Readers Theatre

- 3.3 The Forty Fortunes: A Tale of Iran
- 3.4 Where there is a Will – Mahesh Dattani

## Unit IV Grammar

- 4.1 Phrasal Verbs & Idioms
- 4.2 Modals and Auxiliaries
- 4.3 Verb Phrases – Gerund, Participle, Infinitive

## Unit V Composition/ Writing Skills

- 5.1 Official Correspondence – Leave Letter, Letter of Application, Permission Letter
- 5.2 Drafting Invitations
- 5.3 Brochures for Programmes and Events

### Text Books (Latest Editions)

1. Wangari Maathai – Nobel Lecture. Nobel Prize Outreach AB 2023. Jul 2023.
2. Mahesh Dattani, Where there is a Will. Penguin, 2013.
3. Martin Hewings, Advanced English Grammar, Cambridge University Press, 2000
4. Essential English Grammar by Raymond Murphy

### Web Resources

1. WangariMaathai – Nobel Lecture. Nobel Prize Outreach AB 2023. Mon. 17 Jul 2023.  
<https://www.nobelprize.org/prizes/peace/2004/maathai/lecture/>
2. Telephone Conversation - Wole Soyinka [https://www.k-state.edu/english/westmank/spring\\_00/SOYINKA.html](https://www.k-state.edu/english/westmank/spring_00/SOYINKA.html)
3. Anxiety Monster-RhonaMcFerran [www.poetrysoup.com](http://www.poetrysoup.com)



## **PLANT DIVERSITY-III BRYOPHYTES AND PTERIDOPHYTES**

### **Learning Objectives**

- To enable the students to have an overview of General characters classification and economic importance of Bryophytes
- To understand the morphological diversity, structure and reproduction of Bryophytes.
- To know the General characters and classification of Pteridophytes.
- To understand the morphological diversity, structure and reproduction of Pteridophytes.
- To gain knowledge on the economic uses of Pteridophytes

### **UNIT I**

#### **BRYOPHYTES .**

General characters of Bryophytes, classification (Rothmaler 1951. Upto the order level) .Economic importance of Bryophytes – Ecological importance (Pollution indicators and monitoring), Medicinal uses, horticulture, industrial uses and absorbent bandages.

### **UNIT II**

Structure, reproduction and life histories of the following classes each with a suitable example: Hepaticopsida (Marchantia);, Anthocerotopsida (Anthoceros) and Bryopsida (Polytrichum).

### **UNIT III**

#### **PTERIDOPHYTES**

General Characters of Pteridophytes - Classification (Sporne, 1951).. Apogamy and apospory, homospory and heterospory.

### **UNIT IV**

Morphology, anatomy and reproduction of the forms belonging to the following classes: Psilotopsida (Psilotum), Lycopsida (Selaginella),

### **UNIT V**

Morphology, anatomy and reproduction of the forms belonging to the class Pteropsida (Marsilea). Economic importance of Pteridophytes- Medicinal uses, horticulture, industrial and ecological uses.

### **Recommended Texts**

1. Sharma, O.P. 2017. Bryophyta, Mac Millan India Ltd. Delhi.
2. Alam, A. 2020. Contemporary Research on Bryophytes Book Series: Recent Advances in Botanical Science. 10.2174/97898114337881200101.





3. Alain Vanderpoorten. 2009. Introduction to Bryophytes, 1st Edition, Cambridge University Press.
4. Chopra, R. N. 2005. Biology of bryophytes. New Age International (P) Ltd. New Delhi, India.
5. Prem Puri. 2001. Bryophytes– morphology growth and differentiation. Atma Ram & Sons. Lucknow, India.

### Reference Books

1. Eames, A. 1963. Morphology of lower vascular plant, McGraw Hill, Chennai.
2. Parihar. N.S. 1967. An introduction of Embryophyta, Vol.III – Pteridophyta, Central book depot, Allahabad.
3. Smith, G.M. 1955. Cryptogamic Botany, Volume-II– McGraw Hill, Chennai
4. Sporne, K.L. 1976. Morphology of Pteridophytes, 4th edition, B.I. Publication. Chennai.
5. Watson, E.V. 1963. The structure and Life of Bryophytes. Hutchinson & Co, UK.
6. Parihar, N.S. 1991. Bryophytes. Central Book Depot, Allahabad.
7. Parihar, N.S. 1996. The Biology and Morphology of Pteridophytes. Central Book Depot, Allahabad.

### Web Resources:

1. <http://www.bryoecol.mtu.edu/>
2. <https://www.amazon.in/Introduction-Bryophytes-Alain-Vanderpoorten-ebook/dp/B007NFWQK>
3. <http://scitec.uwichill.edu.bb/bcs/bl14apl/bryo1.htm>
4. [http://www.bsienviis.nic.in/Database/Pteridophytes-in-India\\_23432.aspx](http://www.bsienviis.nic.in/Database/Pteridophytes-in-India_23432.aspx)
5. <http://www.botany.ubc.ca/bryophyte/mossintro.html>
6. aeTIUC&redir\_esc=y

## PLANT DIVERSITY III BRYOPHYTES AND PTERIDOPHYTES – PRACTICAL-III

### Learning Objectives

- To enable students to learn the skill of hand sectioning .
- To study diversity of morphological diversity, structure and reproduction of Bryophytes..
- To understand the morphological diversity, anatomical structure and reproduction Pteridophytes
- To Develop skills in micro preparation of reproductive structures of Bryophytes and Pteridophytes
- To identify Bryophytes and Pteridophytes in natural habitats.

### PRACTICALS

#### Bryophytes

1. Study of morphology, anatomy and structure of the vegetative and reproductive organs of Bryophytes genera included in the theory syllabus. Pteridophytes
2. Study of morphology, anatomy and structure of the vegetative and reproductive organs of Pteridophytes genera included in the theory syllabus.
3. Botanical excursion- Field Study & Submission of report.



### 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. Ashok, M. Bendre and Kumar. 2010. A text book of Practical Botany, Algae, Fungi, Lichen, Bryophyta, Pteridophyta, Gymnosperms and Palaeobotany. Revised edition. Published by Rakesh Kumar Rastogi publication.
4. Prem Puri. 2001. Bryophytes– morphology growth and differentiation. Atma Ram & Sons. Lucknow, India.
5. Tuba Z., Slack N.G. and Stark L.R. 2011. Bryophyte Ecology and Climate Change. Cambridge university press, Cambridge.

### Reference Books

1. Ashok, M. Bendre and Kumar. 2010. A text book of Practical Botany, Algae, Fungi, Lichen, Bryophyta, Pteridophyta, Gymnosperms and Palaeobotany. Revised edition. Published by Rakesh Kumar Rastogi publication.
2. Mohammed Gufran Khan, Shite Gatew and Bedilu Bekele. 2012. Practical manual for Bryophytes and Pteridophytes. Lambert Academic Publishing.
3. Puri, P. 1980. Bryophytes. Atma Ram and Sons, New Delhi.
4. Sporne, K.R. 1991. The Morphology of Pteridophytes. B.I. Publ. Pvt. Ltd. Chennai.
5. Vashista, P.C. 1971. Botany for Degree students: Pteridophyta. S.Chand & Co. New Delhi.

### Web resources

1. <https://www.amazon.in/Manual-Practical-Bryophyta-Suresh-Kumar/dp/B0072GNFX4>
2. <https://www.amazon.in/Practical-Manual-Pteridophyta-Rajan-Sundara/dp/8126106883>
3. <http://www.eeb.uconn.edu/people/goffinet/Classificationmosses.html>
4. <https://www.vitalsource.com/products/introduction-to-bryophytes-alain-vanderpoorten-v9780511738951?duration=perpetual>
5. <https://www.toppr.com/guides/biology/plant-kingdom/pteridophytes/>

## CHEMISTRY FOR BIOLOGICAL SCIENCES I

(FOR BOTANY AND ZOOLOGY)

### Objectives of the course

This course aims at providing knowledge on

- basics of atomic orbitals, chemical bonds,
- hybridization and fundamentals of organic chemistry
- nuclear chemistry and industrial chemistry
- importance of speciality drugs and
- separation and purification techniques



**UNIT- I****Chemical Bonding and Nuclear Chemistry**

Chemical Bonding: Molecular Orbital Theory-bonding, antibonding and non-bonding orbitals. M. O diagrams for Hydrogen, Helium, Nitrogen; discussion of bond order and magnetic properties.

Nuclear Chemistry: Fundamental particles Isotopes, Isobars, Isotones and Isomers- Differences between chemical reactions and reactions- group displacement law. Nuclear binding energy - mass defect calculations. Nuclear fission and nuclear fusion differences Stellar energy. Applications of radioisotopes - carbon dating, rock dating and medicinal applications.

**Unit –II****Industrial Chemistry**

Fuels: Fuel gases: Natural gas, water gas, semi water gas, carbureted water gas, producer gas, CNG, LPG and oil gas (manufacturing details not required).

Silicones: Synthesis, properties and uses of silicones.

Fertilizers: Urea, ammonium sulphate, potassium nitrate NPK fertilizer, superphosphate, triple superphosphate.

**UNIT –III****Fundamental Concepts in Organic Chemistry**

Hybridization: Orbital overlap hybridization and geometry of CH<sub>4</sub>, C<sub>2</sub>H<sub>4</sub>, C<sub>2</sub>H<sub>2</sub> and C<sub>6</sub>H<sub>6</sub>. Polar effects: Inductive effect and consequences on K<sub>a</sub> and K<sub>b</sub> of organic acids and bases, electromeric, mesomeric, hyper conjugation and steric- examples.

Reaction mechanisms: Types of reactions-aromaticity (Huckel's rule) aromatic electrophilic substitution; nitration, halogenation, Friedel- Craft's alkylation and acylation. Heterocyclic compounds: Preparation, properties of pyrrole and pyridine.

**UNIT- IV****Drugs and Speciality Chemicals**

Definition, structure and uses: Antibiotics viz., Penicillin, Chloramphenicol and Streptomycin; Anaesthetics viz., Chloroform and ether: Antipyretics viz., aspirin, paracetamol and ibuprofen; Artificial Sweeteners viz., saccharin, Aspartame and cyclamate; Organic Halogen compounds viz., Freon, Teflon

**UNIT –V****Analytical Chemistry**

Introduction qualitative and quantitative analysis. Principles of volumetric analysis. Separation and purification techniques: extraction, distillation and crystallization. Chromatography: principle and application of column, paper and thin layer



chromatography.

### Recommended Text

1. V.Veeraiyan, Text book of Ancillary Chemistry, High mount publishing house, Chennai, first edition, 2009.
2. S.Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur, 2006.
3. S.ArunBahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand and Company, NewDelhi, 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 Book

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

## INORGANIC VOLUMETRIC ANALYSIS (LAB)

### VOLUMETRIC ANALYSIS

1. Estimation of sodium hydroxide using standard sodium carbonate.
2. Estimation of hydrochloric acid using standard oxalic acid.
3. Estimation of ferrous sulphate using standard mohrs salt.
4. Estimation of oxalic acid using standard ferrous sulphate.
5. Estimation of potassium permanganate using standard sodium hydroxide.
6. Estimation of magnesium using EDTA.
7. Estimation of ferrous ion using diphenyl amine as indicator.

### Reference Book

1. V.Venkateswaran, R.Veerassamy, A.R.Kulandaivelu, Basic Principles of Practical Chemistry; Sultan Chand & sons, Second edition, 1997.

## HERBAL TECHNOLOGY

### Learning Objectives

- To provide an overview of Herbal medicines.
- To gain an insight into the commercially important secondary products .
- To understand the basic concept of Pharmacognosy
- To recognize the phytochemical screening methods.
- To know the methods of processing and storage of herbal drugs

### UNIT I

Herbal Technology: Definition and scope; Herbal medicines: history and scope; Traditional systems of medicine, and overview of AYUSH (Traditional Indian Systems of Medicine); Cultivation, harvesting, processing and storage of herbs and herbal products.



**UNIT II**

Major herbs used as herbal medicines-, Ocimum. Nutraceuticals- Embilica officinale,, cosmetics- Aloe vera, and biopesticides-Neem,, their Botanical names, plant parts used, major chemical constituents and their uses.

**UNIT III**

Pharmacognosy - Binomial, botany of the plant part used and active principles of the following herbs: Curcuma, Fenugreek, Catharanthus roseus, Withania somnifera, Centella asiatica, Tinospora.

**UNIT IV**

Analytical pharmacognosy: Phytochemical screening tests for secondary metabolites - alkaloids, flavonoids, steroids, triterpenoids, phenolic compounds.

**UNIT V**

Processing - storage of herbs and herbal products, quality control for use in herbal formulations.

**Recommended Texts**

1. AYUSH ([www.indianmedicine.nic.in](http://www.indianmedicine.nic.in)). About the systems—An overview of Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homeopathy. New Delhi: Department of Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homoeopathy (AYUSH), Ministry and Family Welfare, Government of India.
2. Evans, W.C. 2009: Trease and Evans PHARMACOGNOSY. 16th Edition, SAUNDERS / Elsevier.
3. Sivarajan, V.V. and India, B. 1994. Ayurvedic Drugs and Their Plant Sources.. Oxford & IBH Publishing Company, 1994 - Herbs - 570 pages.
4. Miller, L. and Miller, B. 2017. Ayurveda & Aromatherapy: The Earth Essential Guide to Ancient Wisdom and Modern Healing. Motilal Banarsidass,; Fourth edition .
5. Kokate, C.K. 2003. Practical Pharmacognosy. Vallabh Prakashan, Pune.

**Reference Books**

1. Agarwal, P., Shashi, Alok., Fatima, A. and Verma, A. 2013. Current scenario of Herbal Technology worldwide: An overview. Int J Pharm Sci Res; 4(11): 4105-17.
2. Arber, Agnes. 1999. Herbal Plants and Drugs. Mangal Deep Publications, Jaipur.
3. Varzakas, T., Zakynthinos, G, and Francis Verpoort, F. 2016. Plant Food Residues as a Source of Nutraceuticals and Functional Foods. Foods 5 : 88.
4. Aburjai, T. and Natsheh, F.M. 2003. Plants Used in Cosmetics. Phytotherapy



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5. Patri, F. and Silano, V. 2002. Plants in cosmetics: Plants and plant preparations used as ingredients for cosmetic products - Volume 1. ISBN 978-92-871-8474-0, pp 218.

### Web resources

1. <https://www.kopykitab.com/Herbal-Science>
2. [https://kadampa.org/books/free-ebook-download-howtotyl?gclid=CjwKCAiA6vXwBRBKEiwAYE7iS5t8yenurCIUCTdV9olKo9TbyAh4fsoFqPYWGs5qBTbytD22z7lo0BoCYnUQAvD\\_BwE](https://kadampa.org/books/free-ebook-download-howtotyl?gclid=CjwKCAiA6vXwBRBKEiwAYE7iS5t8yenurCIUCTdV9olKo9TbyAh4fsoFqPYWGs5qBTbytD22z7lo0BoCYnUQAvD_BwE)
3. [https://www.barnesandnoble.com/b/free-ebooks/nook-books/alternative-medicine-natural-healing/herbal-medicine/\\_/N-ry0Z8qaZ11iu](https://www.barnesandnoble.com/b/free-ebooks/nook-books/alternative-medicine-natural-healing/herbal-medicine/_/N-ry0Z8qaZ11iu)
4. <http://cms.herbalgram.org/heg/volume8/07July/HerbalEBooks.html?t=1310004932&ts=1579066352&signature=1dd0d5aef818b19bcdcd6c063a78e404>
5. <https://www.dattanibookagency.com/books-herbs-science.html>
6. <https://www.springer.com/gp/book/9783540791157>

## ENVIRONMENTAL STUDIES

### Course Objectives:

The main objectives of this course are:

- Enable the students to be aware of our natural resources, ecosystems and their linkages to society, livelihood, environment and conservation.

### Unit I

#### Multidisciplinary Nature of Environmental Studies and Natural Resources:

Concept of Renewable and non-renewable resource, Natural resources and associated problems: Forest resources: Deforestation, Timber extraction, mining, dams and their effects. Water resources: Over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Land resources: Land degradation, man induced landslides, soil erosion and desertification.

### UNIT II

**Ecosystem:** Concept of an Ecosystem, Structure and Functions of Ecosystem, Energy flow in the Ecosystem; Ecological Succession, Food Chains, Food webs and Ecological Pyramids, Characteristic Features of the following Ecosystem: Forest Ecosystem, Grassland Ecosystem and Desert Ecosystem, Aquatic Ecosystem (Ponds, Streams, Lakes, Rivers and Ocean Estuaries)



### UNIT III

**Biodiversity and its Conservation:** Definition, levels and values of biodiversity; Threats to biodiversity- habitat loss, poaching of wildlife, man-wildlife conflicts, IUCN categories of threat; Terrestrial and marine hotspots of biodiversity in India; Conservation of Biodiversity - In-situ and Ex-situ conservation; Conservation schemes :Gir lion sanctuary project, Project tiger, Project elephant, Conservation of sea turtles in India. Ecotourism

### UNIT IV

**Environment Pollution:** Types, causes, effects, and control - Air, Water, Soil and Noise pollution. Nuclear hazards and human health risks. Solid waste management: Control measure of urban and industrial waste. Climate change global warming, ozone layer depletion, acid rain, and impacts on human communities and agriculture

### UNIT V

**Social Issues and the Environment:** Sustainable Development, Water Conservation, Resettlement and rehabilitation of people. Disaster Management: Floods, earthquake, cyclone and landslides. Consumerism and waste products; Environment Protection Act; Air and water (Prevention and control of Pollution) Act; Wild life protection Act; Forest conservation Act; Environmental movements (Chipko, Silent valley, Bishnois of Rajasthan). Environmental ethics. Environmental communication and public awareness.

### Reading list

1. Erach Bharucha, 2021, Textbook of Environmental Studies for Undergraduate Courses, Third Edition, Orient blackswan Pvt. Ltd., Hyderabad.
2. V.K. Ahluwalia, Environmental Studies (Second Edition), Ane books India, T-Nagar, Chennai.
3. Y.K. Singh, 2006, Environmental science, New Age International (P) Ltd., Publishers, New Delhi.
4. S. P. Misra, 2023, Essential Environmental Studies, 4th Edn, Ane Books Pvt. Ltd., New Delhi.
5. G.S. Vijayalakshmi, A.G.Murugesan and N.Sukumaran, 2006, Basics of Environmental Science, Manonmaniam Sundaranar University Publications, Tirunelveli.

### Recommended texts

1. N.Arumugam and V. Kumaresan, 2014, Environmental studies, 4th edition, Saras Publication, Nagercoil, TamilNadu.
2. M.Basu, and S. Xavier, 2016, Fundamentals of Environmental Studies, Cambridge University Press.
3. A.K. Mitra and R. Chakraborty, 2016, Introduction to Environmental Studies, Book Syndicate.
4. J.S. Singh, S.P.Singh, and S.R. Gupta, 2014, Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi.

