

Kuvempu University Bachelor of Science (B.Sc.)

Semester Scheme

SKILL ENHANCEMENT COURSE FOR UG BOTANY

Govt. of Karnataka (As per G.O. No.: ED 166 UNE 2023, Bengaluru, dated: 08-05-2024)

IV – Semester

Title: Ecological Techniques and Environmental Quality Assessment

Practical Knowledge/Skill based Course – IV (Compulsory Course)

BOT4.1: Botany Practical / Skill based Course]

BOTANY- IV SEMESTER SKILL ENHANCEMENT COURSE (SEP) COURSE STRUCTURE

Course No.	Type of course	Theory/ Practical	Credits	Hours/ week	Total hours/ semester	Duration of Exam	Formative assessment mark	Summative assessment marks	Total marks
	SEC	PRACTICAL	02	04	64	03 hours	10	40	50

Course Objectives

- To provide practical knowledge on **water and soil analysis techniques** such as pH estimation, hardness, alkalinity, dissolved oxygen, soil texture, and moisture content.
- To train students in **ecological field methods** including quadrat and transect techniques for vegetation analysis.
- To develop skills in **biodiversity assessment** through phytoplankton studies and calculation of species diversity indices (Shannon Index).
- To impart understanding of **ecosystem processes** such as litter decomposition and nutrient cycling.
- To familiarize students with **solid waste survey, classification, and environmental impact assessment** in local areas.
- To introduce students to **basic mapping and GIS tools** for preparing location and thematic maps of study areas.

Course outcome

- **Demonstrate competency** in analyzing water and soil samples using standard laboratory and field techniques.
- **Apply ecological sampling methods** such as quadrat and transect techniques to determine density, frequency, and abundance of plant species.
- **Calculate and interpret biodiversity indices**, including species diversity measures, to evaluate ecosystem health.
- **Recognize and classify phytoplankton and invasive plant species**, and explain their ecological roles and impacts.
- **Evaluate environmental quality and solid waste management practices** through systematic field surveys.
- **Compile and present scientific field reports and thematic maps**, reflecting analytical and practical skills in environmental studies.

List of Experiments:

1. **Estimation of pH of different water samples using pH paper / pH meter**
(Pond / lake / tap / well water)
2. Determination of Soil texture (Sedimentation method) and estimation of Soil moisture content by gravimetric method
3. **Estimation of Total hardness/Alkalinity/Dissolved Oxygen (DO) of water samples**
4. **Phytoplankton studies of a freshwater body**
(Collection, identification and diversity recording)
5. **Study of quadrats – Density, Frequency and Abundance of plant species**
6. **Study of vegetation by Transect method.**
7. **Calculation of species diversity using Shannon Diversity Index.**
8. **Study of litter decomposition rate by litter-bag method**
9. **Solid waste survey and classification in the campus / local area**
10. **Preparation of a location map / thematic map of the study area using Map or GIS tools**
11. **Study of invasive plant species and their ecological impact**
12. **Field visit and report preparation**

Note: A minimum of 10 experiments should be conducted

ASSESSMENT PATTERN

Assessment Component	Marks
Summative Assessment (Practical Exam – End Semester)	40 Marks
Formative Assessment (Internal – C1 & C2)	10 Marks
Total	50 Marks

Summative Practical Examination – Mark Summary

Question	Component	Marks
Q1	Titration – Water analysis	10
Q2	Phytoplankton identification	5
Q3	Quadrat data analysis	10
Q4	Spotter – Solid waste and Invasive species	5
Q5	Record submission	5
Total (Summative)		40 Marks

PRACTICAL EXAMINATION PATTERN

Maximum Marks (Summative): 40

Formative Assessment (C1 + C2): 10 Marks

Q1. Estimate the total hardness/Alkalinity/Dissolved Oxygen (DO) for the given sample A and write the Principle, Procedure, Result and Conclusion (Any ONE). (10 Marks)

Q2. Identify any two phytoplankton in the given water sample and draw a neat labeled diagram. (5 Marks)

Q3. Analyze the given data and calculate the following (Quadrat method):

- Density
- Frequency
- Abundance(any two)(10 Marks)

Q4. Identify the given material/ Photograph and comment on it. (2X 5 =10 Marks)

Q5. Record submission. (5 Marks)

PRACTICAL EXAMINATION KEY TO THE EXAMINERS

Q1. Titration – Water Analysis(Any ONE)(10 Marks)

Estimation of Total hardness/Alkalinity/Dissolved Oxygen (DO) in the given water sample

Marks distribution

Component	Marks
Procedure	3
Observation and calculation	4
Result and inference	3
Total	10

Q2. Phytoplankton – Identification (Any TWO)(5 Marks)

Identify any two Phytoplankton's from the given water sample and draw diagrams.

Marks distribution (for two specimens together)

Component	Marks
Mounting	2
Staining	1
Diagram and key characters	2
Total	5

Q3. Data analysis – Quadrat method(10 Marks)

Students have to calculate:

- Density
- Frequency
- Abundance

(Required field data will be provided in the question paper.)

Marks distribution

Component	Marks
Correct formula and calculation	6
Tabulation and presentation	2
Interpretation	2
Total	10

Q4. Spotter – Solid waste study(2X5 =10 Marks)

Photo / material related to solid waste and Invasive species:

- Identification=1
- Write a brief explanation / significance=4

Marks distribution

Component	Marks
Identification	1
Explanation / significance	4

Q5. Record submission (5 Marks)**Summative Practical Examination – (10 Marks)**

Question	Component	Marks
Q1	Titration	10
Q2	Phytoplankton identification	5
Q3	Quadrat data analysis	10
Q4	Solid waste spotter	5
Q5	Record submission	5
Q6	Field report submission	5
Total (Summative)		40 Marks

Formative Assessment – Internal (10 Marks)

Component	Basis of assessment	Marks
C1	Attendance	5
C2	Assignment	5
Total (Formative)		10 Marks

Selected References

1. **Vashishta, P.C.** (2014). *Botany for Degree Students – Ecology*. S. Chand Publishing, New Delhi.
→ Useful for quadrat, transect, diversity index, and vegetation studies.
2. **Pandey, B.P.** (2013). *College Botany, Vol. III*. S. Chand Publishing, New Delhi.
→ Covers ecology, phytoplankton, and environmental studies basics.
3. **Sharma, P.D.** (2015). *Ecology and Environment*. Rastogi Publications, Meerut.
→ Good reference for biodiversity indices, ecosystem studies, and pollution concepts.
4. **Singh, J.S. & Singh, S.P.** (1992). *Forests of Himalaya: Structure, Functioning and Impact of Man*. Gyanodaya Prakashan, Nainital.
→ Useful for vegetation analysis and ecological methods.
5. **Misra, R.** (1968). *Ecology Workbook*. Oxford & IBH Publishing Co., New Delhi.
→ Standard practical manual for quadrat, transect, density, frequency, abundance, and Shannon index.
6. **Trivedy, R.K. & Goel, P.K.** (1986). *Chemical and Biological Methods for Water Pollution Studies*. Environmental Publications, Karad.
→ Reference for water analysis (pH, hardness, alkalinity, DO).
7. **APHA (Indian Edition Adaptations)** (Latest Edition). *Standard Methods for the Examination of Water and Wastewater*.
→ Reference for titration procedures and water quality analysis.
8. **Subramanyam, K.** (2012 Reprint). *Textbook of Botany, Vol. VI – Ecology*. S. Chand Publishing.
→ Covers phytoplankton, ecological techniques, vegetation sampling.
9. **Agarwal, K.C.** (2001). *Environmental Biology*. Nidi Publishers, Bikaner.
→ Useful for soil studies, waste management, and environmental monitoring.
10. **Odum, E.P. & Barrett, G.W. (Indian Reprint Edition)** (2005). *Fundamentals of Ecology*. Brooks/Cole (Indian Edition).
→ Standard reference for Shannon index, ecosystem concepts, and litter decomposition.