



KARNATAK UNIVERSITY, DHARWAD
ACADEMIC (S&T) SECTION
ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಧಾರವಾಡ
ವಿದ್ಯಾಮಂಡಳ (ಎಸ್&ಟಿ) ವಿಭಾಗ



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NAAC Accredited
'A' Grade 2014

website: kud.ac.in

No. KU/Aca(S&T)/SSL-394A/2022-23/1056

Date: 23 SEP 2022

ಅಧಿಸೂಚನೆ

ವಿಷಯ: 2022-23ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸುಗಳಿಗೆ 3 ಮತ್ತು 4ನೇ ಸೆಮೆಸ್ಟರ್
NEP-2020 ಮಾದರಿಯ ಪಠ್ಯಕ್ರಮವನ್ನು ಅಳವಡಿಸಿರುವ ಕುರಿತು.

- ಉಲ್ಲೇಖ: 1. ಸರ್ಕಾರದ ಅಧೀನ ಕಾರ್ಯದರ್ಶಿಗಳು(ವಿಶ್ವವಿದ್ಯಾಲಯ 1) ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆ ಇವರ
ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 260 ಯುಎನ್ಇ 2019(ಭಾಗ-1), ದಿ:7.8.2021.
2. ವಿಜ್ಞಾನ & ತಂತ್ರಜ್ಞಾನ ನಿಖಾಯ ಸಭೆಯ ಠರಾವುಗಳ ದಿನಾಂಕ: 06.09.2022
3. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂ. 01, ದಿನಾಂಕ: 17.09.2022
4. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶ ದಿನಾಂಕ: 22-09-2022

ಮೇಲ್ಕಾಣಿಸಿದ ವಿಷಯ ಹಾಗೂ ಉಲ್ಲೇಖಗಳನ್ವಯ ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶದ ಮೇರೆಗೆ, 2022-23ನೇ
ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ, ವಿಜ್ಞಾನ & ತಂತ್ರಜ್ಞಾನ ನಿಖಾಯದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸುಗಳ ರಾಷ್ಟ್ರೀಯ ಶಿಕ್ಷಣ ನೀತಿ
(NEP)-2020 ರಂತೆ 3 ಮತ್ತು 4ನೇ ಸೆಮೆಸ್ಟರ್ಗಳಿಗಾಗಿ ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದಿತ
ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಪ್ರಕಟಪಡಿಸಿದ್ದು, ಸದರ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕ.ವಿ.ವಿ. www.kud.ac.in ಅಂತರ್ಜಾಲದಿಂದ ಡೌನ್‌ಲೋಡ
ಮಾಡಿಕೊಳ್ಳಲು ಸೂಚಿಸುತ್ತಾ, ವಿದ್ಯಾರ್ಥಿಗಳು ಹಾಗೂ ಸಂಬಂಧಿಸಿದ ಎಲ್ಲ ಬೋಧಕರ ಗಮನಕ್ಕೆ ತಂದು ಅದರಂತೆ
ಕಾರ್ಯಪ್ರವೃತ್ತರಾಗಲು ಕವಿವಿ ಅಧೀನದ / ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ ಸೂಚಿಸಲಾಗಿದೆ.

ಅಡಕ: ಮೇಲಿನಂತೆ

ಕುಲಸಚಿವರು.

ಗೆ,

ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ಬರುವ ಎಲ್ಲ ಅಧೀನ ಹಾಗೂ ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ
ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ. (ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ ಹಾಗೂ ಮಿಂಚಂಚೆ ಮೂಲಕ ಬಿತ್ತರಿಸಲಾಗುವುದು)

ಪ್ರತಿ:

1. ಕುಲಪತಿಗಳ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
2. ಕುಲಸಚಿವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
3. ಕುಲಸಚಿವರು (ಮೌಲ್ಯಮಾಪನ) ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
4. ಅಧೀಕ್ಷಕರು, ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆ / ಗೌಪ್ಯ / ಜಿ.ಎ.ಡಿ. / ವಿದ್ಯಾಂಡಳ (ಪಿ.ಜಿ.ಪಿ.ಎಚ್.ಡಿ) ವಿಭಾಗ, ಸಂಬಂಧಿಸಿದ
ಕೋರ್ಸುಗಳ ವಿಭಾಗಗಳು ಪರೀಕ್ಷಾ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
5. ನಿರ್ದೇಶಕರು, ಕಾಲೇಜು ಅಭಿವೃದ್ಧಿ / ವಿದ್ಯಾರ್ಥಿ ಕಲ್ಯಾಣ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.



KARNATAK UNIVERSITY, DHARWAD

04 – Year B.Sc. (Hons.) Program

SYLLABUS

Subject: Botany

[Effective from 2022-2023]

**DISCIPLINE SPECIFIC CORE COURSE (DSCC) FOR SEM III AND IV AND
OPEN ELECTIVE COURSE (OEC) FOR SEM III AND IV.**

AS PER NEP- 2020

KARNATAK UNIVERSITY, DHARWAD

**Four Years Under Graduate Program in Botany for B.Sc. (Hons.)
Effective from 2022-23**

Sem	Type of Course	Theory/ Practical	Instruction hour per week	Total hours of Syllabus / Sem	Duration Of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks	Credits
III	DSCC	Theory	04 hrs	56	02 hrs	40	60	100	04
		Practical	04 hrs	52	03 hrs	25	25	50	02
	OEC-3	Theory	03 hrs	42	02 hrs	40	60	100	03
IV	DSCC	Theory	04 hrs	56	02 hrs	40	60	100	04
		Practical	04 hrs	52	03 hrs	25	25	50	02
	OEC-4	Theory	03 hrs	42	02 hrs	40	60	100	03

B.Sc.: Semester – III
Subject: Botany
Theory: Discipline Specific Core Course (DSCC)

The Course Botany in III semester has two papers (Theory paper- 033 BOT 011 for 04 credits and Practical paper- 033 BOT 012 for 02 credits) for 06 credits: Both the papers are compulsory, Details of the courses are as

Course No.: 05
Course code (Theory): 033 BOT 011

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/ Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
033 BOT 011	DSCC	Theory	04	04	56 hrs	2hrs	40	60	100

Title of the Course and Code:
DSSC 033 BOT 011: PLANT ANATOMY AND DEVELOPMENT BIOLOGY

Course Outcomes:

On completion of this course, the students will be able to:

1. Observation of variations that exist in internal structure of various parts of a plant and as well as among different plant groups in support for the evolutionary concept.
2. Skill development for the proper description of internal structure using botanical terms, their identification and further classification.
3. Induction of the enthusiasm on internal structure of locally available plants.
4. Understanding various levels of organization in a plant body with an outlook in the relationship between the structure and function through comparative studies.
5. Observation and classification of the floral variations from the premises of college and house.
6. Understanding the various reproductive methods sub-stages in the life cycle of plants
7. Observation and classification of the embryological variations in angiosperms.
8. Enthusiasm to understand evolution based on the variations in reproduction among plants.

PLANT ANATOMY

Unit 1: ANGIOSPERM ANATOMY, PLANT CELL STRUCTURE AND TISSUES

14 Hrs

Introduction, objectives and scope of Plant Anatomy, Plant cell structure – nature of plant cell wall.

Tissue and tissue systems - meristematic tissue, permanent tissue and secretory cells.

Classification of meristem: (apical, intercalary and lateral), primary and secondary meristem.

Apical meristem: Theories on organization of meristem (apical cell theory, Tunica-Corpus theory, histogen theory and Korper-Kappe theory), quiescent centre, Root cap.

Evolution and concept of organization of shoot apex (Apical cell theory, Histogen theory, Tunica Corpus theory continuing meristematic residue, cytohistological zonation).

Unit II: MORPHOGENESIS AND DIFFERENTIATION

14 Hrs.

Morphogenesis in plants - Differentiation of root, stem and leaf.

Types of vascular bundles and Vascular cambium, Origin, development, arrangement and diversity in size and shape of leaves.

Structure of Dicot root: primary and secondary structures (Tridax/Sunflower), Structure of monocot root (Maize).

Structure of Dicot stem: Primary and secondary structures (Tridax/Sunflower), Structure of Monocot stem (Maize), Nodal anatomy.

Structure of Dicot leaf: primary structure (Tridax/Sunflower), primary structure of Monocot leaf (Maize), Stomatal types. Anomalous secondary growth: Aristolochia, Boerhaavia (dicot stem) Dracaena (monocot stem)

Applications in systematics, forensics and Pharmacognosy.

DEVELOPMENT BIOLOGY

Unit III: Morphogenesis and Differentiation

14 Hrs.

Differentiation and cell polarity in acellular (*Dictyostelium*), Unicellular (*Acetabularia*) and multicellular system (root hair and stomata formation) Shoot Apical meristem (SAM): Origin, structure and function, Cytohistological zonation and Ultrastructure of meristems.

Organogenesis: Differentiation of root, stem, leaf and axillary buds, bud dormancy

Mechanism of leaf primordium initiation, development and Phyllotaxis (Diversity in size and shape of leaves)

Structure and function of root apical meristem (RAM): Root cap, quiescent centre and origin of lateral roots.

Transition from vegetative apex into reproductive apex

Developmental patterns at flowering apex: ABC model specification of floral organs.

Modification of gene action by growth hormones and cellular differences between floral organs. Senescence – a general account.

Unit IV: Reproductive Biology

14 Hrs.

Introduction, Scope and contributions of Indian embryologists: P. Maheswari, B G L Swamy, P.Maheshwari, M.S. Swaminathan and K.C. Mehta.

Microsporangium: Development and structure of mature anther, Anther wall layers, Tapetum -types, structure and functions and sporogenous tissue.

Microsporogenesis - Microspore mother cells, microspore tetrads, Pollinia.

Microgametogenesis – Formation of vegetative and generative cells, structure of male gametophyte. Pollen embryosac (Nemec phenomenon).

Megasporangium – Structure of typical Angiosperm ovule. Types of ovule - Anatropous, Orthotropous, Amphitropous, Circinotropous. **Megagametogenesis** – Types of development of Female gametophyte/embryosac- monosporic- *Polygonum* type, bisporic – *Allium* type, tetrasporic - *Fritillaria* type. Structure of mature embryosac.

Pollination and fertilization: Structural and functional aspects of pollen, stigma and style. Post pollination events; Current aspects of fertilization and Significance of double fertilization, Post fertilization changes.

Endosperm – Types and its biological importance. Free nuclear (*Cocos nucifera*) cellular (*Cucumis*), helobial types. Ruminant endosperm.

Embryogenesis – Structure and composition of zygote, Dicot (*Capsella bursa-pastoris*) and Monocot (*Najas*) embryo development. A general account of seed development.

B.Sc. BOTANY: Semester - 3
Practical: Discipline Specific Core Course (DSCC)
Title of the Course and Code:

DSCC 033 BOT 012: PLANT ANATOMY AND DEVELOPMENT BIOLOGY

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/ Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
033 BOT 012	DSCC	Practical	02	04	52 hrs	3hrs	25	25	50

LIST OF EXPERIMENTS TO BE CONDUCTED

Practical No.1

- i) Study of meristem (Permanent slides/ Photographs).
- ii) Study of Simple Tissues (Parenchyma, Collenchyma and Sclerenchyma) and Complex Tissues (xylem and phloem).

Practical No.2

Maceration technique to study elements of xylem and phloem, Study of primary structure of dicot root, stem and leaf (Sunflower) and monocot root, stem and leaf (Maize).

Practical No.3

Study of Normal secondary growth structure in dicot stem and root (Sunflower) and Anomalous secondary growth: *Aristolochia*, *Boerhaavia* (dicot stem) *Dracaena* (monocot stem).

Practical No. 4

Study of trichomes (any three types) and stomata (any three types) with the help of locally available plant materials.

Practical No. 5

Permanent slides of Microsporogenesis and male gametophyte Mounting of Pollen grains of Grass and Hibiscus and Pollinia of Calotropis.

Practical No. 6

Pollen germination (hanging drop method) and Effect of Boron and Calcium on pollen germination.

Practical No. 7

Permanent slides of types of ovules, Megasporogenesis & embryosac development and types of placentation: Axile, Marginal and Parietal types. Sectioning of ovary, for the studied types of placentation.

Practical No. 8

Mounting of embryo: Tridax and Cyamopsis, Mounting of endosperm: Cucumis.

Practical No. 09

Histochemical localization of proteins/ carbohydrates.

Practical No. 10 and 11

Mini project work in groups of 3-5 students, from the following list

- a) Study of pollen morphology of different flowers with respect to shape, colour, aperture etc.
- b) Pollen germination of different pollen grains and calculates percentage of germination.
- c) Calculating percentage of germination of one particular type of pollen grain collected from different localities/ under different conditions.
- d) Study of placentation of different flowers.
- e) Any other relevant study related to Anatomy / Embryology.

Pedagogy

Scheme of Practical Examination (Distribution of Marks): 25 Marks for semester end Examination.

1. Practical: 15 (3X5 to cover all the Practicals) Marks/ Based on Nature of Practical/ Optional/Availability of specimen/ Infrastructure/ Sectioning and staining/ Mounting (may be modified).
 2. Viva: 05 Marks.
 3. Journal: 05 Marks.
- Total 25 Marks.

Note: The same scheme may be used for IA (Formative assessment) Examination.

Text Books for Reference:

1. Bhojwani and Bhatnagar, Introduction to Embryology of Angiosperms –Oxford & IBH, Delhi
2. Bhojwani Sant Saran, 2014.Current Trends in the Embryology of Angiosperms, Woong-Young Soh, Springer Netherlands,
3. Coutler E. G. , 1969. Plant Anatomy – Part I Cells and Tissues – Edward Arnold, London.
4. Dickison, W.C. (2000). Integrative Plant Anatomy, Harcourt Academic Press, USA
5. Eames A. J. - Morphology of Angiosperms - Mc Graw Hill, New York.
6. Esau, K. 1990. Plant Anatomy, Wiley Eastern Pvt Ltd New Delhi
7. Evert, R.F. (2006) Esau's Plant Anatomy: Meristem, Cells, and Tissues of the Plant Body: Their Structure, Function and Development. John Wiley and Sons, Inc
8. Fahn, A.1992. Plant Anatomy, Pergamon Press, USA
9. Johri, B.M. I., 1984.Embryology of Angiosperms, Springer-Verlag, Netherlands.
10. Karp G., 1985. Cell Biology; Mc.Graw Hill Company
11. Maheshwari,P 1950. An introduction to the embryology of angiosperms. New York: McGraw-Hill
12. Mauseth, J.D. (1988). Plant Anatomy, the Benjamin/Cummings Publisher, USA.
13. Nair P .K .K - Pollen Morphology of Angiosperms - Scholar Publishing House, Lucknow
14. Pandey S.N. 1997, Plant Anatomy and Embryology. A. Chadha, Vikas Publication House Pvt Ltd;
15. Pandey, B. P., 1997. Plant Anatomy, S.Chand and Co. New Delhi

16. Raghavan, V., 2000. Developmental Biology of Flowering plants, Springer, Netherlands.
17. Saxena M. R. – Palynology – A treatise - Oxford & I. B .H., New Delhi.
18. Shivanna, K.R., 2003. Pollen Biology and Biotechnology. Oxford and IBH Publishing Co. Pvt.Ltd. Delhi.
19. Vashishta .P.C .,1984. Plant Anatomy – Pradeep Publications – Jalandhar
20. Vashishta, P.C. 1997. Plant Anatomy, Pradeep Publications.
21. N. N. Bhandari The Microsporangium.
22. F. Bouman The Ovule.
23. M. T. M. Willems, J. L. van Went: The Female Gametophyte.
24. R. B. Knox :The Pollen Grain.
25. J. L. van Went, M. T. M. Willems :Fertilization.

B.Sc. – III Semester
Subject: Botany
Open Elective Course (OEC - 3)
(OEC for other students)
Code: OEC-003 BOT 051

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures / Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
003 BOT 051	OEC	Theory	03	03	42 hrs	2 hrs	40	60	100

OEC-3 (OEC for other students): 003 BOT 051
Title of the Paper: BOTANICAL GARDEN AND LANDSCAPING

Learning outcomes:

After the completion of this course the learner will be able to:

- Apply the basic principles and components of gardening
- Conceptualize flower arrangement and bio-aesthetic planning
- Design various types of gardens according to the culture and art of bonsai
- Distinguish between formal, informal and free style gardens
- Establish and maintain special types of gardens for outdoor and indoor landscaping

Keywords:

Gardening, Landscaping, Flower arrangement, Vertical gardens, Roof gardens, Computer aided designing

Unit I

14 lectures

Principles of gardening, garden components, adornments, lawn making, methods of designing rockery, water garden, etc. Special types of gardens, their walk-paths, bridges, constructed features. Green house, Special types of gardens, trees, their design, values in landscaping, propagation, planting shrubs and herbaceous perennials. Importance, design values, propagation, planting, climbers and creepers, palms, ferns, grasses and cacti succulents.

Unit II

14 lectures

Flower arrangement: importance, production details and cultural operations, constraints, post-harvest practices. Bio-aesthetic planning, definition, need, round country planning, urban planning and planting avenues, schools, villages, beautifying railway stations, dam sites, hydroelectric stations, colonies, river banks, planting material for play grounds.

Unit III

14 lectures

Vertical gardens, roof gardens. Culture of bonsai, art of making bonsai. Parks and public gardens. Land scape designs, Styles of garden, formal, informal and freestyle gardens, types of gardens, Urban land scaping, Land scaping for specific situations, institutions, industries, residents, hospitals, road sides, traffic islands, dam sites, IT parks, corporate. Establishment and maintenance, special types of gardens, Bio-aesthetic planning, eco- tourism, indoor gardening, therapeutic gardening, non-plant components, water-scaping, xeri-scaping, hardscaping; Computer Aided Designing (CAD) for outdoor and indoor scaping Exposure to CAD (Computer Aided Designing) components of a nursery, sowing, pricking, use of greenhouse for nursery production, propagation through cuttings, layering, grafting and budding.

Ethnobotany and Folk medicines. Definition; Ethnobotany in India: Methods to study ethnobotany; Applications of Ethnobotany: National interacts, Palaeo-ethno-botany. Folk medicines of ethnobotany, ethnomedicine, ethnoecology, ethnic communities of India.

Suggested Readings

1. Berry, F. and Kress, J. (1991). Heliconia: An Identification Guide. SmithsonianBooks
2. Butts, E. and Stensson, K. (2012). Sheridan Nurseries: One hundred years of People, Plans, and Plants. Dundurn Group Ltd.
3. Russell, T.(2012). Nature Guide: Trees: The world in your hands (Nature Guides).

Details of Formative Assessment (IA) For DSCC theory/OEC: 40% weightage for Total Marks

Type of Assessment	Weightage	Duration	Comment
Written Test- 1	10%	1 hrs	8 th Week
Written Test- 2	10%	1 hrs	12 th Week
Seminar	10%	10 minutes	-----
Case study/ Assignment/ Field work/ Project work/ Activity	10%	-----	-----
Total	40% of the Maximum marks allotted for the Paper		

**Faculty of Science
04- Year UG Honors Programme: 2022-23**

**General Pattern of Theory Question paper for DSCC/ OEC
(60 Marks for semester end Examination with 2 hrs duration)**

Part-A

1. Question number 1-6 carries 2 marks each. Answer any 5 questions. :10 marks

Part- B

2. Question number 7-11 carries 5 marks each. Answer any 4 questions. :20 marks

Part- C

3. Question number 12- 15 carries 10 marks each. Answer any 3 question. : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Format for Model Question paper Unit wise
DSCC 033 BOT 012: PLANT ANATOMY AND DEVELOPMENT BIOLOGY

Question Number	Number of question to be set in Unit	Number of questions to be answered	Marks of each question	Max marks for the question
1	Unit-I ----2 Unit II ----1 Unit III ----1 Unit IV ----2 Total- 6	Lower Order Teaching Skills (LOTS) (Remembering and Learning)		
		5	2	10
2	Unit-I ----1 Unit II ----2 Unit III ----1 Unit IV ----1 Total- 5	High Order Teaching Skills (HOTS) (Analyzing, Evaluating and Creating Descriptive Question)		
		4	5	20
3	Unit-I ----1 Unit II ----1 Unit III ----1 Unit IV ----1 Total- 4	3	10	30

OEC-003 BOT 051
BOTANICAL GARDEN AND LANDSCAPING

Question Number	Number of question to be set in Unit	Number of questions to be answered	Marks of each question	Max marks for the question
1	Unit-I ----2 Unit II ----2 Unit III ----2 Total- 6	Lower Order Teaching Skills (LOTS) (Remembering and Learning)		
		5	2	10
2	Unit-I ----1 Unit II ----2 Unit III ----2 Total- 5	High Order Teaching Skills (HOTS) (Analyzing, Evaluating and Creating Descriptive Question)		
		4	5	20
3	Unit-I ----2 Unit II ----1 Unit III ----1 Total- 4	3	10	30

B.Sc.: Semester – IV**Subject: Botany****Discipline Specific Core Course (DSCC)**

The Course Botany in III semester has two papers (Theory paper- 033 BOT 011 for 04 credits and Practical paper- 033 BOT 012 for 02 credits) for 06 credits: Both the papers are compulsory, Details of the courses are as

Course no: 7

Course Code: 034 BOT 011

Number of Theory Credits	Total Lecture Hours/Semester	Number of Practical Credits	Total Practical hours/Semester
04	56	02	56

Title of the course (theory): DSSC ECOLOGY AND CONSERVATION BIOLOGY

Course outcome**Students will be able to**

- Know the principles and concept of ecosystems- Components, productions, Energy and limiting factors.
- Know the concepts of productivity, measurements of productivity, food chain, food webs and trophic levels
- Understand the diversity and characters of major ecosystems – Aquatic (Marine and Freshwater), Terrestrial and Agricultural ecosystems
- Know the Concept of biotic community with their Size and structure of biotic community- Physiognomy, Life-forms, stratification, ecotones and concept of edge-effect.
- Understand the causes and patterns of ecological succession, concept of climax.
- Know the Concept of ecological niches, species coexistence, overlapping and niche segregation.
- Know the concept of Eutrophication, Heavy metal pollution, Ozone depletion, greenhouse effect, Global warming and its effect, Acid rains. Pesticide, particulate and nuclear radiation.
- Understand the Solid wastes. Noise Pollution. Pest population and its biological control, invasive species and their effects on native species in aquatic and terrestrial ecosystems.
- Know the Patterns of diversity in a community, Diversity measurement and indices.
- Understand the Global distribution of organisms, concept of islands, biodiversity hotspots. Methods of conservation of biodiversity. Centers for origin of cultivator plants.
- Know the population density, Natality and mortality. Life table, population growth curves, carrying capacity.
- Know the positive and negative interactions among the organisms.

Contents of Theory Course		
Unit	Topics	Teaching Hours
I	<p>Introduction to Ecology and Conservation Biology: Definitions, Principles of Ecology, Brief History, Major Indian Contributions, Scope and importance. Ecological levels of organisation.</p> <p>Ecological factors: Climatic factors: light, temperature, precipitation and humidity. Edaphic factors: Soil and its types, soil texture, soil profile, soil formation; physico-chemical properties of soil - mineral particle, soil pH, soil aeration, organic matter, soil humus and soil microorganisms. Topographic Factors: Altitude</p>	14 hrs

	<p>Ecological groups of plants and their adaptations: Morphological and anatomical adaptations of hydrophytes, xerophytes, epiphytes and halophytes.</p>	
II	<p>Ecosystem Ecology: Introduction, types of ecosystems with examples -terrestrial and aquatic, natural and artificial.</p> <p>Structure of ecosystem: Biotic and Abiotic components, detailed structure of a pond ecosystem.</p> <p>Ecosystem functions and processes: Food chain-grazing and detritus; Food web.</p> <p>Ecological pyramids -Pyramids of energy, biomass and number. Principles of Energy flow in ecosystem.</p> <p>Bio-geo chemical cycles: Gaseous cycles -carbon and nitrogen, Sedimentary cycle- Phosphorus.</p> <p>Ecological succession: Definition, types- primary and secondary. General stages of succession. Hydrosere and xerosere.</p> <p>Community Ecology: Community and its characteristics – frequency, density, Abundance, cover and basal area, phenology, stratifications, life-forms. Concept of Ecotone and Ecotypes.</p> <p>Intra-specific and Inter-specific interactions with examples.</p> <p>Ecological methods and techniques: Methods of sampling plant communities – transects and quadrates. Remote sensing as a tool for vegetation analysis, land use – land cover mapping.</p> <p>Population Ecology: Population and its characteristics – Population density, natality, mortality, age distribution, population growth curves and dispersal.</p>	14 hrs
III	<p>Phytogeography and Environmental issues:</p> <p>Theory of land bridge, theory of continental drift, polar oscillations and glaciations. Centre of origin of plant – Vavilov’s concept, types. Phytogeographical regions – concept, phytogeographical regions of India.</p> <p>Vegetation types of Karnataka – Composition and distribution of evergreen, semi-evergreen, deciduous, scrub, mangroves, shoal forests and grasslands. An account of the vegetation of the Western Ghats.</p> <p>Pollution: Water pollution: Causes, effect, types; water quality indicators, water quality standards in India, control of water pollution (Waste water treatment).</p> <p>Water pollution disasters – National mission on clean Ganga , Minimata, Pacific gyre garbage patch, Exxon valdez oil spill.</p> <p>Air pollution: Causes, effect, air quality standards, acid rain, control.</p> <p>Soil pollution: Causes, effect, solid waste management, control measures of soil pollution.</p>	14hrs
IV	<p>Biodiversity and its conservation:</p> <p>Biodiversity: Definition, types of biodiversity - habitat diversity, species diversity and genetic diversity, Global and Indian species diversity. SDG’s in biodiversity conservation.</p> <p>Values of Biodiversity – Economic and aesthetic value, Medicinal and timber yielding plants. NTFP. Threats to biodiversity.</p> <p>Concept of Biodiversity Hotspots, Biodiversity hot spots of India.</p> <p>Concept of endemism and endemic species.</p> <p>ICUN plant categories with special reference to Karnataka/ Western Ghats.</p> <p>Biodiversity Conservation- Indian forest conservation act, Biodiversity bill (2002).</p> <p>Conservation methods – <i>In-situ</i> and <i>ex-situ</i> methods</p>	14 hrs

	<i>In-situ</i> methods –Biosphere reserves, National parks, Sanctuaries, Sacred grooves. <i>Ex-situ</i> methods-Botanical gardens, Seed bank, Gene banks, Pollen banks, Culture collections, Cryopreservation.	
Total		56 Hours

SUGGESTED REFERENCE BOOKS:

1. Sharma, P.D. 2018. Fundamentals of Ecology. Rastogi Publications.
2. Odum E.P. (1975): Ecology By Holt, Rinert& Winston.
3. Oosting, H.G. (1978): Plants and Ecosystem Wadworth Belmont.
4. Kochhar, P.L. (1975): Plant Ecology. (9th Edn.,) New Delhi, Bombay, Calcutta-226pp.,
5. Kumar, H.D. (1992): Modern Concepts of Ecology (7th Edn.,) Vikas Publishing Co., New Delhi.
6. Kumar H.D. (2000): Biodiversity & Sustainable Conservation. Oxford & IBH Publishing Co Ltd. New Delhi.
7. Newman, E.I. (2000): Applied Ecology, Blackwell Scientific Publisher, U.K.
8. Chapman, J.L&M.J. Reiss (1992): Ecology (Principles & Applications). Cambridge University Press, U.K.
9. Malcolm L. Hunter Jr., James P. Gibbs, Viorel D. Popescu, 2020. Fundamentals of Conservation Biology, 4th Edition. Wiley-Blackwel.
10. Saha T. K., 2017. Ecology and Environmental Biology. Books and Allied Publishers.

B.Sc. BOTANY: Semester - 4
Theory: Discipline Specific Core Course (DSCC)
Title of the Course and Code:
DSSC 034 BOT 012: ECOLOGY AND CONSERVATION BIOLOGY

LIST OF PRACTICALS TO BE CONDUCTED

Practical No.	Experiments
1	Determination of pH of different types of Soils, Estimation of salinity of soil/water samples.
2	Study of Ecological instruments – Wet and Dry thermometer, Altimeter, Hygrometer, Soil thermometer, Rain Gauge, Barometer, etc
3	Hydrophytes: Morphological adaptations in <i>Pistia</i> , <i>Eichhornia</i> , <i>Hydrilla</i> , <i>Nymphaea</i> . Anatomical adaptations in <i>Hydrilla</i> (stem) and <i>Nymphaea</i> (petiole).
4	Xerophytes: Morphological adaptations in <i>Asparagus</i> , <i>Casuarina</i> , <i>Acacia</i> , <i>Aloe vera</i> , <i>Euphorbia tirucalli</i> . Anatomical adaptations in phylloclade of <i>Casuarina</i> .
5	Epiphytes: Morphological adaptations in <i>Acampe</i> , <i>Bulbophyllum</i> , <i>Drynaria</i> . Anatomical adaptations in epiphytic root of <i>Acampe/ Vanda</i> . Halophytes: study of Viviparyin mangroves, Morphology and anatomy of Pneumatophores.
6	Study of a pond/forest ecosystem and recording the different biotic and abiotic components
7	Demonstration of different types of vegetation sampling methods – transects and quadrats. Determination of Density and frequency.
8	Application of remote sensing to vegetation analysis using satellite imageries
9	Field visits to study different types of local vegetations/ecosystems and the report to be written in practical record book.
10	Determination of water holding capacity of soil samples
11	Determination of Biological oxygen demand (BOD)
12	Determination of Chemical oxygen demand (COD)
13	Determination of soil texture of different soil samples.

Pedagogy

Scheme of Practical Examination (Distribution of Marks): 25 Marks for semester end Examination.

1. Practical: 15 (3X5 to cover all the Practicals) Marks/ Based on Nature of Practical/ Optional/Availability of specimen/ Infrastructure/ Sectioning and staining/ Mounting (may be modified).
 2. Viva: 05 Marks.
 3. Journal: 05 Marks.
- Total 25 Marks.

Note: The same scheme may be used for IA (Formative assessment) Examination.

B.Sc. BOTANY – IV Semester
Open Elective Course (OEC - 4)
(OEC for other students)
Paper: MEDICINAL PLANTS IN HEALTH CARE
Code: OEC-004 BOT 051

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures / Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC-004 BOT 051	OEC	Theory	03	03	42 hrs	2 hrs	40	60	100

Learning outcomes:

On completion of this course, the students will be able to:

- Recognize the basic medicinal plants
- Apply techniques of conservation and propagation of medicinal plants.
- Setup process of harvesting, drying and storage of medicinal herbs
- Propose new strategies to enhance growth of medicinal herbs considering the practical issues pertinent to India

Keywords:

Medicinal plants, Traditional systems, endangered medicinal plants, Ethnobotany, Folk medicines, Ethnic communities

Unit I: History and Traditional System of Medicine **14 lectures**

History, Scope and Importance of Medicinal Plants; Traditional systems of medicine; Definition and Scope.

Ayurveda: History, origin, panchamahabhutas, saptadhatu and tridosha concepts, Rasayana, plants used in ayurvedic treatments,

Siddha: Origin of Siddha medicinal systems, Basis of Siddha system, plants used in Siddha medicine.

Unani: History, concept: Umoor-e-tabiya, tumors treatments / therapy, polyherbal formulations.

Unit II: Conservation, Augmentation and Ethnobotany and Folk Medicine 14 lectures

Conservation of Endemic and endangered medicinal plants, Red list criteria; *In situ* conservation: Biosphere reserves, sacred groves, National Parks; *Ex situ* conservation: Botanic Gardens, Ethnomedicinal plant Gardens.

Propagation of Medicinal Plants: Objectives of the nursery, its classification, important

Unit III Medicinal Plants

14 lectures

Brief description of selected plants and derived drugs, namely Guggul (*Commiphora*) for hypercholesterolemia, *Boswellia* for inflammatory disorders, Arjuna (*Terminalia arjuna*) for cardioprotection, turmeric (*Curcuma longa*) for wound healing, antioxidant and anticancer properties, Kutaki (*Picrorhiza kurroa*) for hepatoprotection, Opium Poppy for analgesic and antitussive, *Salix* for analgesic, *Cincona* and *Artemisia* for Malaria, *Rauwolfia* as tranquilizer, Belladonna as anticholinergic, *Digitalis* as cardiotoxic, *Podophyllum* as antitumor.

Suggested Readings:

1. Akerele, O., Heywood, V. and Synge, H. (1991). The Conservation of Medicinal Plants. Cambridge University Press.
2. AYUSH (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.
3. CSIR- Central Institute of Medicinal and Aromatic Plants, Lucknow (2016). *Aush Gyanya: Handbook of Medicinal and Aromatic Plant Cultivation*.
4. Dev, S. (1997). Ethno-therapeutics and modern drug development: The potential of Ayurveda. *Current Science* 73:909–928.
5. Evans, W.C. (2009). Trease and Evans Pharmacognosy, 16th edn. Philadelphia, PA: Elsevier Saunders Ltd.
6. Jain, S.K. and Jain, Vartika. (eds.) (2017). *Methods and Approaches in Ethnobotany: Concepts, Practices and Prospects*. Deep Publications, Delhi
7. Kapoor, L.D. (2001). *Handbook of Ayurvedic medicinal plants*. Boca Raton, FL: CRC Press.
8. Saroya, A.S. (2017). *Ethnobotany*. ICAR publication.
9. Sharma, R. (2003). *Medicinal Plants of India-An Encyclopaedia*. Delhi: Daya Publishing House.
10. Sharma, R. (2013) *Agro Techniques of Medicinal Plants*. Daya Publishing House, Delhi.
11. Thakur, R.S., H.S. Puri, and Husain, A. (1989). *Major medicinal plants of India*. Central Institute of Medicinal and Aromatic Plants, Lucknow, India.

Details of Formative Assessment (IA) For DSCC theory/OEC: 40% weightage for Total Marks

Type of Assessment	Weightage	Duration	Comment
Written Test- 1	10%	1 hrs	8 th Week
Written Test- 2	10%	1 hrs	12 th Week
Seminar	10%	10 minutes	-----
Case study/ Assignment/ Field work/ Project work/ Activity	10%	-----	-----
Total	40% of the Maximum marks allotted for the Paper		

**Faculty of Science
04- Year UG Honors Programme: 2022-23**

**General Pattern of Theory Question paper for DSCC/ OEC
(60 Marks for semester end Examination with 2 hrs duration)**

Part-A

1. Question number 1-6 carries 2 marks each. Answer any 5 questions. :10 marks

Part- B

2. Question number 7-11 carries 5 marks each. Answer any 4 questions. :20 marks

Part- C

3. Question number 12- 15 carries 10 marks each. Answer any 3 question. : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Format for Model Question paper Unit wise
DSCC 034 BOT 011: DSCC ECOLOGY AND CONSERVATION BIOLOGY

Question Number	Number of question to be set in Unit	Number of questions to be answered	Marks of each question	Max marks for the question
1	Unit-I ----2 Unit II ----1 Unit III ----1 Unit IV ----2 Total- 6	Lower Order Teaching Skills (LOTS) (Remembering and Learning)		
		5	2	10
2	Unit-I ----1 Unit II ----2 Unit III ----1 Unit IV ----1 Total- 5	High Order Teaching Skills (HOTS) (Analyzing, Evaluating and Creating Descriptive Question)		
		4	5	20
3	Unit-I ----1 Unit II ----1 Unit III ----1 Unit IV ----1 Total- 4	3	10	30

OEC-004 BOT 051
MEDICINAL PLANTS IN HEALTH CARE

Question Number	Number of question to be set in Unit	Number of questions to be answered	Marks of each question	Max marks for the question
1	Unit-I ----2 Unit II ----2 Unit III ----2 Total- 6	Lower Order Teaching Skills (LOTS) (Remembering and Learning)		
		5	2	10
2	Unit-I ----1 Unit II ----2 Unit III ----2 Total- 5	High Order Teaching Skills (HOTS) (Analyzing, Evaluating and Creating Descriptive Question)		
		4	5	20
3	Unit-I ----2 Unit II ----1 Unit III ----1 Total- 4	3	10	30