RANI CHANNAMMA UNIVERSITY, BELAGAVI

PROGRAM /COURSE STRUCTURE AND SYLLABUS
as per the Choice Based Credit System (CBCS) designed in accordance with
Learning Outcomes-Based Curriculum Framework (LOCF)
of National Education Policy (NEP) 2020
for

Bachelor of Science (Botany)

B.Sc III and IV sem

w.e.f.

Academic Year 2022-23 and onwards

PREAMBLE

The objective of a B.Sc. (Honors) programme in Higher Education system is to prepare its students for the society. The current pattern is designed to provide a focused learning outcome-based syllabus at the Honors level providing structured teaching-learning experiences catering to the needs of the students. The honors courses will prepare the students both academically and in terms of employability. The programme also inculcates various attributes at the Honors level. These attributes encompass values related to emotional stability, social justice, creative and critical thinking, well-being and various skills required for employability, thus preparing students for continuous learning and sustainability. The new curriculum based on learning outcomes of BSc (Honours) Botany offers knowledge of areas including Plant Systematics, Plant Biotechnology, Resource Botany, Genetics, Ecology, Conservation biology, Physiology and Bioinformatics, Medicinal plants, Plant diseases management etc. The courses define clearly the objectives and the learning outcomes, enabling students to choose the elective subjects broadening their skills in the field of Botany. The course also offers skills to pursue research and teaching in the field of Botany and thus would produce best minds to meet the demands of society This curriculum framework for the bachelor-level program in Botany is developed keeping in view of the student-centric learning pedagogy, which is entirely outcome-oriented and curiosity-driven. To avoid a rote-learning approach and foster imagination, the curriculum is more leaned towards self-discovery of concepts. The curriculum framework focuses on the pragmatist approach whereby practical application of theoretical concepts is taught with substantial coverage of practical and field works.

Aims of Bachelor's degree programme in Botany

The broad aims of the bachelor's degree programme in Botany are:

1. To provide an environment that ensures the cognitive development of students in a holistic manner. A dialogue about plants and their significance is fostered in this framework, rather than didactic monologues on mere theoreticalaspects
2. To provide the latest subject matter, both theoretical as well as practical, such a way to foster their core competency and discovery learning. A botany graduate as envisioned in this framework would be sufficiently competent in the field to undertake further discipline-specific studies, as well as to begin domain-relatedemployment.
3. To mould a responsible citizen who is aware of the most basic domain-independent knowledge, including critical thinking andcommunication.
4. To enable the graduate to prepare for national as well as international competitive examinations, especially UGC-CSIR NET, and UPSC Civil ServicesExamination.

Program Learning Outcomes

The students graduating with the Degree B.Sc. Three years and B. Sc. (Honors) Botany should be able toacquire.

Core competency: Students will acquire core competency in the subject Botany, and allied subject areas.

1. The student will be able to identify major groups of plants and compare the characteristics of lower (e.g. algae and fungi) and higher (angiosperms and gymnosperms)plants.
2. Students will be able to use the evidence-based comparative botany approach to explain the evolution of organisms and understand the genetic diversity on the earth. The students will be able to explain various plant processes and functions, metabolism, concepts of gene, genome, and how organism's function is influenced at the cell, tissue, and organ level.
3. Students will be able to understand the adaptation, development, and behavior of different forms oflife.
4. The understanding of networked life on earth and tracing the energy pyramids through nutrient flow is expected from thestudents.
5. Students will be able to demonstrate the experimental techniques and methods of their area of specialization inBotany.

Analytical ability:

The students will be able to demonstrate the knowledge in understanding research and addressing practicalproblems.

1. Application of various scientific methods to address different questions by formulating the hypothesis, data collection, and critically analyze the data to decipher the degree to which their scientific work supports theirhypothesis.

Critical Thinking and problem-solving ability:

An increased understanding of fundamental concepts and their applications of scientific principles is expected at the end of this course. Students will become critical thinkers and acquire problem-solving capabilities.

Digitally equipped:

Students will acquire digital skills and integrate the fundamental concepts with modern tools.

Ethical and Psychological strengthing: Students will also strengthen their ethical and moral values and shall be able to deal with psychological weaknesses.

Team Player: Students will learn team workmanship in order to serve efficiently institutions, industry, and society.

Independent Learner: Apart from the subject-specific skills, generic skills, especially in botany, the program outcome would lead to gain knowledge and skills for further higher studies, competitiveexaminations,andemployment.Learningoutcomes-basedcurriculumwouldensure equal academic standards across the country and a broader picture of their competencies. The Bachelor's program in Botany and Botany honors may be mono-disciplinary or multidisciplinary with following broad objectives.

1. Critically evaluation of ideas and arguments by collecting relevant information about the plants, to recognize the position of the plant in the broad classification and phylogenetic level.
2. Identify problems and independently propose solutions using creative approaches,

acquired through interdisciplinary experiences, and a depth and breadth of knowledge/expertise in the field of Plant Identification.

3. Accurately interpretation of collected information and use taxonomical information to evaluate and formulate a position of the plant in taxonomy.
4. Students will be able to apply the scientific method to questions in botany by formulating testable hypotheses, collecting data that address these hypotheses, and analyzing those data to assess the degree to which their scientific work supports theirhypotheses.
5. Students will be able to present scientific hypotheses and data both orally and in writing in the formats that are used by practicingscientists.
6. Students will be able to access the primary literature, identify relevant works for a particular topic, and evaluate the scientific content of theseworks.
7. Students will be able to apply fundamental mathematical tools (statistics, calculus) and physical principles (physics, chemistry) to the analysis of relevant biologicalsituations.
8. Students will be able to identify the major groups of organisms with an emphasis on plants and be able to classify them within a phylogenetic framework. Students will be able to compare and contrast the characteristics of plants, algae, and fungi that differentiate them from each other and other forms oflife.
9. Students will be able to use the evidence of comparative biology to explain how the theory of evolution offers the only scientific explanation for the unity and diversity of life on earth. They will be able to use specific examples to explicate how descent with modification has shaped plant morphology, physiology, and lifehistory.
10. Students will be able to explain the ecological interconnectedness of life on earth by tracing energy and nutrient flow through the environment. They will be able to relate the physical features of the environment to the structure of populations, communities, andecosystems
11. Students will be able to demonstrate proficiency in the experimental techniques and methods of analysis appropriate for their area of specialization withinbiology.

B. Sc. Botany Course outcomes under NEP program

The framework of curriculum for the Bachelor's program in Botany aims to transform the course content and pedagogy to provide a multidisciplinary, student-centric, and outcome-based, holistic education to the next generation ofstudents.

Aside from structuring the curriculum to be more in-depth, focused, and comprehensive with significant skill-set for all exit levels; keeping in mind the job prospects; the emphasis has been to maintain academic coherence and continuum throughout the program of study and help build a strong footing in the subject, thereby ensuring a seamless transition into theircareers.

Special attention is given to eliminate redundancy, discourage rote learning, and espouse a problem-solving, critical thinking, and inquisitive mindset among learners.

The curriculum embraces the philosophy that science is best learned through experiential learning, not limited to the confines of a classroom but rather through hands-on training, projects, field studies, industrial visits, andinternships.

This updated syllabus, with modern technology, helps students stay informed on the leading-edge developments in plant sciences and promotes curiosity, innovation, and a passion for research, that will serve them well in their journey into scientific adventure and discovery beyondgraduation.

The goal is to equip students with holistic knowledge, competencies, professional skills, and a strong positive mindset that they can leverage while navigating the current stiff challenges of the job market.

Program Outcomes:

By the end of the program the students will be able to:

(Refer to literature on outcome based education (OBE) for details on Program Outcomes)

PO1: Skill development for the proper description using botanical terms, identification, naming and classification of life forms especially plants and microbes.
PO2: Acquisition of knowledge on structure, life cycle and life processes that exist among plant and microbial diversity through certain model organism studies.
PO3: Understanding of various interactions that exist among plants and microbes; to develop the curiosity on the dynamicity of nature.
PO4: Understanding of the major elements of variation that exist in the living world through comparative morphological and anatomical study.
PO5: Ability to explain the diversity and evolution based on the empirical evidences in morphology, anatomy, embryology, physiology, biochemistry, molecular biology and life history.

PO6: Skill development for the collection, preservation and recording of information after observation and analysis- from simple illustration to molecular database development.

PO7: Making aware of the scientific and technological advancements- Information and Communication, Biotechnology and Molecular Biology for further learning and research in all branches of Botany..

PO8: Internalization of the concept of conservation and evolution through the channel of spirit of inquiry.

PO 9: To enable the graduates to prepare for national as well as international level competitive examinations like UGC-CSIR, UPSC, KPSC etc.

PO10: To enable the students for practicing the best teaching pedagogy as a biology teacher including the latest digital modules.

PO 11: The graduates should be knowledgeable and competent enough to appropriately deliver on aspects of global importance like climate change, SDGs, green technologies etc at the right opportunity.

PO 12: The graduate should be able to demonstrate sufficient proficiency in the hands-on experimental techniques for their area of specialization within biology during research and in the professional career.

RANI CHANNAMMA UNIVERSITY

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Proposed Curricular and Credits Structure under Choice Based Credit System [CBCS] of Botany Major& One Minor Discipline Scheme for the Four Years B.Sc. Undergraduate Honors Programme with effect from 2021-22

SEMESTER-I											
Category	**Course code**	**Title of the Paper**	**Marks**			**Teaching hours/week**			**Credit**	**Duration of exams (Hrs)**
			IA	**SEE**	**Total**	**L**	**T**	**P**		
L1	21BSC1L1LK1	Kannada	40	60	100	4	-	-	3	3
	21BSC1L1LFK1	Functional Kannada								
L2	21BSC1L2LEN2	English	40	60	100	4	-	-	3	3
	21BSC1L2LHI2	Hindi								
	21BSC1L2LSN2	Sanskrit								
	21BSC1L2LTE2	Telugu								
	21BSC1L2LUR2	Urdu								
DSC1	21BSC1BOT1L	Microbial Diversity and technology	40	60	100	4	-	-	4	3
	21BSC1BOT1P	Microbial Diversity and technology	15	35	50	-	-	4	2	3
DSC1	Another Department Code	Another Department Course Title	40	60	100	4	-	-	4	3
			15	35	50	-	-	4	2	3
SEC1	21BSC1SE1CS1	Digital Fluency	15	35	50	1	-	2	2	2
VBC1	21BSC1V1PE1	Physical Education - Yoga	15	35	50	-	-	2	1	2
VBC2	21BSC1V2HW1	Health & Wellness	15	35	50	-	-	2	1	2
OEC1	21BSC1BOT1		40	60	100	3	-	-	3	3
			Total Marks		**750**	**Semester Credits**			**25**	

SEMESTER-II

Category	Course code	Title of the Paper	Marks			Teaching hours/week			Credit	Duration of exams (Hrs)
			IA	SEE	Total	L	T	P		
L3	21BSC2L3LK2	Kannada	40	60	100	4	-	-	3	3
	21BSC2L3FKL2	Functional Kannada								
L4	21BSC2L4EN2	English	40	60	100	4	-	-	3	3
	21BSC2L4HI2	Hindi								
	21BSC2L4SN2	Sanskrit								
	21BSC2L4TE2	Telugu								
	21BSC2L4UR2	Urdu								
DSC2	21BSC2BOT2L	Diversity of Non flowering plants	40	60	100	4	-	-	4	3
	21BSC2BOT2P	Diversity of Non flowering plants	15	35	50	-	-	4	2	3
DSC2	Another Department Code	Another Department Course Title	30	70	100	4	-	-	4	3
			15	35	50	-	-	4	2	3
AECC1	21BSC2AE1ES2	Environmental Studies	15	35	50	1	-	2	2	2
VBC3	21BSC2V3PE2	Physical Education-Sports	15	35	50	-	-	2	1	2
VBC4	21BSC2V4NC1	NCC/NSS/R&R(S&G) / Cultural	15	35	50	-	-	2	1	2
OEC2	21BSC2BOT2		40	60	100	3	-	-	3	3
			Total Marks		**750**	**Semester Credits**			**25**	

SECOND YEAR; SEMESTER-III										
Category	**Course code**	**Title of the Paper**	**Marks**			**Teaching hours/week**			**Credit**	**Duration of exams (Hrs)**
			IA	**SEE**	**Total**	**L**	**T**	**P**		
L5	21BSC3L5LK3	Kannada	40	60	100	4	-	-	3	3
	21BSC3L5LFK3	Functional Kannada								
L6	21BSC3L6EN3	English	40	60	100	4	-	-	3	3
	21BSC3L6HI3	Hindi								
	21BSC3L6SN3	Sanskrit								
	21BSC3L6TE3	Telugu								
	21BSC3L6UR3	Urdu								
DSC3	21BSC2BOT3L	Plant Anatomy and Developmental Biology	40	60	100	4	-	-	4	3
	21BSC2BOT3P	Plant Anatomy and Developmental Biology	15	35	50	-	-	4	2	3
DSC3	Another Department Code	Another Department Course Title	40	60	100	4	-	-	4	3
			15	35	50	-	-	4	2	3
SEC2	21BSC3SE2ES2	Artificial Intelligence	15	35	50	1	-	2	2	2
VBC5	21BSC3V5PE3	Physical Education- Sports	15	35	50	-	-	2	1	2
VBC6	21BSC3V6NC2	NCC/NSS/R&R(S &G) / Cultural	15	35	50	-	-	2	1	2
OEC3	21BSC2BOT3		40	60	100	3	-	-	3	3
			Total Marks		**750**	**Semester Credits**			**25**	

SEMESTER-IV										
Category	**Course code**	**Title of the Paper**	**Marks**			**Teaching hours/week**			**Credit**	**Duration of exams (Hrs)**
			IA	**SEE**	**Total**	**L**	**T**	**P**		
L7	21BSC4L7LK4	Kannada	40	60	100	4	-	-	3	3
	21BSC4L7LFK4	Functional Kannada								
L8	21BSC4L8EN4	English	40	60	100	4	-	-	3	3
	21BSC4L8HI4	Hindi								
	21BSC4L8SN4	Sanskrit								
	21BSC4L8TE4	Telugu								
	21BSC4L8UR4	Urdu								
DSC4	21BSC2BOT4L	Ecology and Conservation Biology	40	60	100	4	-	-	4	3
	21BSC2BOT4P	Ecology and Conservation Biology	15	35	50	-	-	4	2	3
DSC4	Another Department Code	Another Department Course Title	40	60	100	4	-	-	4	3
			15	35	50	-	-	4	2	3
AECC2	21BSC4AE1ES2	Constitution of India	15	35	50	1	-	2	2	2
VBC7	21BSC4V5PE4	Physical Education-Sports	15	35	50	-	-	2	1	2
VBC8	21BSC4V6NC3	NCC/NSS/R&R(S&G) / Cultural	15	35	50	-	-	2	1	2
OEC4	21BSC2BOT4		40	60	100	3	-	-	3	3
			Total Marks		**750**	**Semester Credits**			**25**	

B.Sc. BOTANY: Semester - 3

Theory: Discipline Specific Core Course (DSCC)

Title of the Course and Code:

BOT-A-3.1: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
BOT A-3.1	DSCC	Theory	04	04	52 hrs	4hrs	40	60	100

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,objectiveand scope of Plant Anatomy, Plant cell structure – nature of plant cell wall. Tissue and tissue systems - meristematic tissue, permanent tissue and secretary cells. Classification of meristem: (apical, intercalary and lateral), primary and secondary meristem. Apical meristem: Theories, **concept and Evolution** on organization of meristem (apical cell theory, Tunica-Corpus theory, histogen theory and Korper-Kappe theory), quiescent centre, Root cap.

Unit II: MORPHOGENESIS AND DIFFERENTIATION 14 Hrs.

Morphogenesis in plants - Differentiation of root, stems 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: Bignonia, Boerhaavia (dicot stem) Dracaena (monocot stem)

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,: Differentiation of root, stem, leaf 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, M.S. Swaminathan and K.C. Mehta.

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

Theory: Discipline Specific Core Course (DSCC)

Title of the Course and Code:

BOT-A-3.2: 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
BOT A-3.2	DSCC	Practical	02	04	52 hrs	4hrs	25	25	50

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: Bignonia, 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. 9 and 10

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.

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. l., 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 Benjammin/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 Publication

RANI CHANNAMMA UNIVERSITY BELGAVI

B.Sc III SEMESTER

SUBJECT: BOTANY (OPEN ELECTIVE COURSE) OEC CODE:-003 BOT 051

Cou rse No.	Typ e of Cou r se	Theory / Practica l	Credit s	Instructi o n hour per week	Total No. of Lectures / Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
003 BOT 051	OE C	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	**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 land scaping, propagation, planting shrubs and herbaceous perennials. Importance, design values, propagation, planting, climbers and creepers, palms, ferns, grasses and cacti succulents.**	**14 Hrs**

Unit II	**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.**	**14 Hrs**
Unit III	**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, Bioaesthetic 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.**	**14 Hrs**
	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 ofPeople, 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 Asesment	Weightage	Duration	Comment
Written Test -1	**10%**	**1 Hrs**	**8th Week**
Written Test-2	**10%**	**1 Hrs**	**12th 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 OEC

(60 Marks for semester end Examination with 2 hrs duration)

1	Part-A	Question number 1-6 carries 2 marks each. Answer any 5 questions.	10 Marks
2	Part-B	Question number 7-11 carries 5 marks each. Answer any 4 questions.	20 Marks
3	Part-C	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			

Practical Question Paper Pattern

RANI CHANNAMMA UNIVERSITY ELGAVI

B.Sc Botany III Semester (NEP) Plant

Anatomy and Development Biology

Time: 04 Hrs Max Marks: 25

Q No I	**Make a double stained micro preparation of T.S of material 'A' Draw a labeled diagram (Show the preparation to the Examiners)**	**05 Marks**
Q No II	**Mount Endosperm/Embryo in specimen 'B' and draw the diagram (Show the preparation to the Examiners)**	**05 Marks**
Q No III	**Identify and mention the important features observed in the slides C,D,E,F and G.**	**10 Marks**
Q No IV	**Mini Project Submission**	**05 Marks**
	Total	**25**

Instruction to Examiners

Q No I- For double staining preparation give the stem of Bignonia,Boerhaavia &

Dracena stem any one.

Preparation -03 Diagram -02 (05)

Q No II-Mount Endosperm/ Embryo

Preparation -03 Diagram -02- (05)

Q No III- Two slides from Anatomy(C-Simple tissue & D-Complex tissue),

Two slides from Embryology (E & F) and 'G'- Trichome/ Stomata.

(10)

Submission (05)

Question Paper Pattern

RANI CHANNAMMA UNIVERSITY BELGAVI

B.Sc Botany III Semester (NEP)

Subject: Code: Maximum Marks: 60

Answer any Six Questions from Question no I
Answer any Three each Questions from Question no II, III, IV and V

QNO I	Answer any Six Questions (At least Two questions from each unit) 1 2 3 4 5 6 7 8	2X6=12
QNO II	Should cover Entire unit I 1 2 3 4	4X3=12
QNO III	Should cover Entire unit II 1 2 3 4	4X3=12
QNO IV	Should cover Entire unit IIII 1 2 3 4	4X3=12
QNO V	Should cover Entire unit IV 1 2 3 4	4X3=12

B.Sc. B0TANY SEMESTER IV

Title of the Course: Ecology and Conservation Biology

Number of Theory Credits	Total Lecture Hours/Semester	Number of Practical Credits	Total Practical hours/Semester
04	**56**	**02**	**56**
	Contents of Theory Course		
Unit 1	**Topics**		**Teaching Hours**
Unit I	Introduction to Ecology and Conservation Biology: Definitions, Principles of Ecology, Brief History, Major Indian Contributions, Scope and importance. Ecological levels of organisation. Ecological factors:Climatic factors:light, temperature, precipitation and humidity. Edaphic factors:Soil and its types, soil texture, soil profile, soil formation; physicochemical properties of soil - mineral particle, soil pH, soil aeration, organic matter, soil humus and soil microorganisms. Topographic Factors: Altitude Ecological groups of plants and their adaptations:Morphological and anatomical adaptations of hydrophytes, xerophytes, epiphytes and halophytes.		**15 Hrs**
Unit II	Ecosystem Ecology:Introduction,types of ecosystems with examples -terrestrial and aquatic, natural and artificial. Structure of ecosystem: Biotic and Abiotic components, detailed structure of a pond ecosystem. Ecosystem functions and processes: Food chain-grazing and detritus; Food web. Ecological pyramids -Pyramids of energy, biomass and number. Principles of Energy flow in ecosystem. Bio-geo chemical cycles: Gaseous cycles -carbon and nitrogen, Sedimentary cyclePhosphorus. Ecological succession: Definition, types- primary and secondary. General stages of succession. Hydrosere and xerosere. Community Ecology: Community and its characteristics – frequency, density, Abundance, cover and basal area, phenology, stratifications, life-forms. Concept of Ecotone and Ecotypes. Intra-specific and Inter-specific interactions with examples. 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. Population Ecology: Population and its characteristics – Population density, natality, mortality, age distribution,		**15 Hrs**

	population growth curves and dispersal.	
Unit III	Phytogeography and Environmental issues: 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. Vegetation types of Karnataka – Composition and distribution of evergreen, semievergreen, deciduous, scrub, mangroves, shoal forests and grasslands. An account of the vegetation of the Western Ghats. Pollution: Water pollution: Causes, effect, types; water quality indicators, water quality standards in India, control of water pollution (Waste water treatment). Water pollution disasters – National mission on clean Ganga ,Minimata, Pacific gyre garbage patch, Exxon valdez oil spill. Air pollution: Causes, effect, air quality standards, acid rain, control. Soil pollution: Causes, effect, solid waste management, control measures of soil pollution.	**11 Hrs**
Unit IV	*Biodiversity and its conservation: Biodiversity: Definition, types of biodiversity - habitat diversity, species diversity and genetic diversity, Global and Indian species diversity. SDG's in biodiversity conservation. Values of Biodiversity – Economic and aesthetic value, Medicinal and timber yielding plants. NTFP. Threats to biodiversity. Concept of Biodiversity Hotspots, Biodiversity hot spots of India. Concept of endemism and endemic species. ICUN plant categories with special reference to Karnataka/ Western Ghats. Biodiversity Conservation- Indian forest conservation act, Biodiversity bill (2002). Conservation methods – In-situ and ex-situmethods In-situmethods –Biosphere reserves, National parks, Sanctuaries, Sacred grooves. Ex-situmethods-Botanical gardens, Seed bank, Gene banks, Pollen banks, Culture collections, Cryopreservation.*	**15 Hrs**
	Total	**56 Hrs**

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

List of Practical's in Ecology and Conservation Biology

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 Pistia, Eichhornia, Hydrilla, Nymphaea. Anatomical adaptations in Hydrilla(stem) and Nymphaea (petiole).
4	Xerophytes: Morphological adaptations in Asparagus, Casuarina, Acacia, Aloe vera, Euphorbiatirucalli. Anatomical adaptations in phylloclade of Casuarina .
5	Epiphytes: Morphological adaptations in Acampe, Bulbophyllum, Drynaria.Anatomical adaptations in epiphytic root of Acampe/ Vanda. 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.

RANI CHANNAMMA UNIVERSITY BELGAVI

B.Sc IV SEMESTER OPEN ELECTIVE COURSE (OEC-4)

PAPER: MEDICINAL PLANTS IN HEALTH CARE

SUBJECT: BOTANY (OEC CODE:-004 BOT 051

Cou rse No.	Typ e of Cou r se	Theory / Practica l	Credit s	Instructi o n hour per week	Total No. of Lectures / Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
004 BOT 051	OE C	Theory	03	03	42 Hrs	2 Hrs	40	60	100

OEC-4 (OEC for other students): 004 BOT 051

Title of the Paper: MEDICINAL PLANTS IN HEALTH CARE

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**
- **thepractical 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** **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.**	**14 Hrs**

Unit II	**Conservation, Augmentation and Ethnobotany and Folk Medicine 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**	**14 Hrs**
Unit III	**Medicinal Plants** **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)f or 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, Belladona as anticholinergic, Digitalis as cardiotonic, Podophyllum as antitumor**	**14 Hrs**
	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, Yogaand 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, 16thedn. 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: DayaPublishing 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 Asesment	Weightage	Duration	Comment
Written Test -1	10%	1 Hrs	8th Week
Written Test-2	10%	1 Hrs	12th 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 OEC

(60 Marks for semester end Examination with 2 hrs duration)

1	Part-A	Question number 1-6 carries 2 marks each. Answer any 5 questions.	10 Marks
2	Part-B	Question number 7-11 carries 5 marks each. Answer any 4 questions.	20 Marks
3	Part-C	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			

Practical Question Paper Pattern

RANI CHANNAMMA UNIVERSITY BELGAVI

B.Sc Botany IV Semester
(NEP) Ecology and
Conservation Biology

Time: 04 Hrs Max Marks: 25

Q No I	**Give the External and Internal features of Ecological adaptations with neat labeled diagram of specimen 'A'**	**05 Marks**
Q No II	**Determination of PH different types of Soils/Water samples 'B'**	**05 Marks**
Q No III	**Identify and describe the features of Ecological interest in slides C and D**	**06 Marks**
Q No IV	**Describe the use and mechanism of Ecological Instrument ' E'**	**04 Marks**
Q No V	**Submission of Field Visit Report**	**05 Marks**
	Total	**25**

Instruction to Examiners

Q No I- Ecological Adaptations- Hydrophytes/Xerophytes/Epiphytes 'A' Preparation -03 Diagram -02 (05)

Q No II-Determination of PH Soil/ Water 'B' (05)

Q No III- Ecological slides – Hydrophytes/Xerophytes/Epiphytes (06)

(Not repeat the Q No I)

Q No IV- Any one Ecological Instrument 'E (04)

Submission of Field Visit Report (05)

Question Paper Pattern

RANI CHANNAMMA UNIVERSITY BELGAVI

B.Sc Botany IV Semester (NEP)

Subject: Code: Maximum Marks: 60

Answer any Six Questions from Question no I

Answer any Three each Questions from Question no II, III, IV and V

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