



**GULBARGA UNIVERSITY KALABURAGI**

**Faculty of Science and Technology**

Syllabus for  
**BACHALER OF SCIENCE WITH  
BOTANY (CBCS)**

(With effect from academic year 2020-21 and onwards)

**Department of Post-graduate Studies and  
Research in Botany  
2019-20**

**The course structure for B.Sc. degree offered with Botany at Gulbarga University, Kalaburagi, with effective from the academic year 2020-21.**

Semester	Course	Course code	Course title	Credits L+P	Teaching hours/week L+P=Total
I	Core courses	BOTCC-1	Microbes, Algae, Fungi and Plant pathology	4+2=6	4+2=6
II		BOTCC-2	Bryophytes, Pteridophytes, Gymnosperms, Morphology.	4+2=6	4+2=6
III		BOTCC-3	Taxonomy, Economic Botany Ethnobotany.	4+2=6	4+2=6
IV		BOTCC-4	Plant Anatomy, Embryology Ecology and Biodiversity.	4+2=6	4+2=6
V	Skill Enhancement courses	BOTSEC-5.2.1	Biofertilizers	1+1=2	1+1=2
		BOTSEC-5.2.2	Herbal Technology	1+1=2	
	Discipline Specific Elective Course	BOTDSE-5.1	Cytology, Molecular Biology Genetics, Plant breeding and Plant propagation.	4+2=6	1+1=2 4+2=6 <hr/> 8+4=10
VI	Skill Enhancement Courses	BOTSEC-6.2.1	Nursery and Gardening	1+1=2	1+1=2
		BOTSEC-6.2.2	Floriculture	1+1=2	
	Discipline Specific Elective Course	BOTDSE-6.1	Plant physiology, metabolism & Biotechnology	4+2=6	1+1=2 4+2=6 <hr/> 8+4=10
<b>Total credits for Botany courses</b>				<b>44</b>	

  
**G M Vidyasagar**  
 Chirman Board of Studies in Botany  
 Gulbarga University, Kalaburagi

## B.Sc. I SEMESTER. CBCS, BOTANY SYLLABUS

### PAPER-1, BOTCC-1 (MICROBES, ALGAE, FUNGI AND PLANT PATHOLOGY,)

60Hrs

#### Unit-I

15hrs

**Microbes:** Introduction of microbe, aim and scope of microbiology. General account of microbes from soil, air and water.

**Viruses:** History and Discovery of Viruses- Characteristic features of Viruses, Structure of TMV and Bacteriophage, Multiplication of Bacteriophage by Lytic and lysogenic methods. Economic importance.

**Bacteria:** Introduction, ultra structure of Bacterial cell, Chemistry of Gram positive and gram negative bacteria cell wall. Reproduction: vegetative, asexual and recombination (conjugation, transformation and transduction). Economic importance of Bacteria. Bacterial inoculation: – *Rhizobium* inoculation and applications.

#### Unit-II

15hrs

**Cynobacteria:** A general account: Characters, occurrence, thallus organization and ultra structure of cyanobacterial cell. Structure, reproduction and type study of *Nostoc* and *Spirulina*. Economic importance of cyanobacteria with reference to Nitrogen fixation and Single cell protein (SCP).

**Algae (Phycology):** A general account, Fritsch classification of algae, characters, habitat, thallus structure, reproduction and life cycle of *Chlamydomonas*, *Volvox*, *Oedogonium*, *Vaucheria*, Diatoms (*Pinnularia* and Diatomaceous earth and its importance). *Sargassum* and *Polysiphonia*. Economic importance of Algae.

#### Unit -III

15hrs

**Fungi (Mycology):** General features occurrence and distribution of fungi, Classification of fungi by Alexopoulos system. Structure and reproduction of *Rhizopus*, *Penicillium*, *Agaricus* and *Cercospora*. Economic importance of Fungi.

**Mycorrhiza:** Introduction, ectomycorrhiza, endomycorrhiza and significance.

#### Unit -IV

15hrs

**Lichens** -Habitat, types, structure and reproduction, economic importance of lichens.

**Plant pathology:** Introduction: disease triangle (Host, pathogen and environment), Terminologies, Koch's postulates. Causal organism, symptoms, etiology and control measures of *Leaf curl of papaya*, *Bunchy top of banana*, *Citrus canker*, *Angular leaf spot of cotton* Causal organism, symptoms, etiology and control measures of the following diseases. *Downy mildew of Bajra*, *Grain smut of Sorghum*, *Wilt of pigeon pea*, *Red rots of sugarcane*.

**Mycoplasma:** A general account. Sandal spike disease.

**Biopesticides:** Introduction, integrated pest management, brief account on Neem and Trichoderma.

-----

## Reference Books:

- 1) **Hans G.Schlegel.** (1993) General Microbiology Volume I. Cambridge University Press. Cambridge.
- 2) **P.D. Sharama.** Microbiology and Plant pathology. Rastogi Publication Meerut.
- 3) **B.P.Pandey.** Plant pathology. S.Chand Publication New Delhi.
- 4) **C.L.Mandahar** (1978). Introduction to plant Viruses.
- 5) **Mathews** (1981). Plant Viruses.
- 6) **F.Whitco and J. Turil.** (1978). The Mycoplasmas-III Plant and insect Mycoplasmas.
- 7) **Fritsch.F.E.** (1935).The Structure and reproduction of algae. Cambridge University Press, England.
- 8) **B.R. Vashishta.** A Text Book of Algae, S.Chand Publication New Delhi.
- 9) **V.Singh, Pandey Jain.** A Text book of Lower Botany. Rastogi Publication Meerut.
- 10) **Alexopoulos & C. V. John** Introduction to Mycology. Wiley & Sons
- 11) **Sharma P. D.** Microbiology & Plant Pathology Rastogi Publications Meerut.
- 12) **R. S. Singh** Plant Diseases 7<sup>th</sup> Edition, Oxford & IBH New Delhi.
- 13) **Agrios G.N.** Plant Pathology, Academic press 1988. San Diego, London.
- 14) **Alexopolus & Mims C.N.,** Introductory Mycology. Willey Eastern, New York 1983
- 15) **Rangaswamy G,** Disease of crop plants of India., printice Hal of India
- 16) **Gangulee & Kar ,** College Botany Vol-II., New Central Book agency, Kolkatta 1993.
- 17) **Mehrotra R.S.,** Plant Pathology, Tata Mc Grew Hills, 1976.
- 18) **Pandey B.P.,** Text book of Algae, Fungi, S.Chand Co Delhi.

## PRACTICALS:

- 1) **Study of Microscope:** Dissection and Compound microscope its parts, how to handle microscope, uses of microscope.
- 2) **Staining techniques:** Staining technique of cyanobacteria and algae specimens using Safranin and mounting in Glycerine.etc.
- 3) **Study of viral disease in plants:** The local available viral disease plants i.e. Cajana, Papaya leaf curls disease and Banana bunchy top disease.
- 4) **Study of Rhizobium from root nodules:** Simple staining of *Rhizobium* from root nodules of any leguminous plants.
- 5) **Permanent slides of bacteria:** Study of permanent slides of bacteria i.e. *Coccus*, *Bacillus*, *Vibrio*, types
- 6) **Grams staining of bacteria:** Study of *Lacto bacillus* bacteria from butter milk.
- 7) **Study of bacterial disease in plants:** The local available bacterial disease plants. ie Citrus canker, Angular leaf spot of Cotton.
- 8) **Study of Fungal disease in plants:** The local available fungal disease plants. ie Downy mildew of Bajra, Grain smut of Sorghum, Wilt of pigeon pea , Red rot of sugarcane.
- 9) **Study of Cyanobacteria:** The available specimens and permanent slides of *Nostoc* and *Spirulina*.etc.

**10) Study of algae:** Study of algae structure from the available specimens and permanent slides based on theory syllabus.

**11) Study of Fungi:** Study of the fungal forms: based on theory: Rhizopus, Pencillum, Agaricus, Cercospora.

**12) Study of Biopesticides:** Study of Biopesticides: based on theory, Neem and Trichoderma.

**13) Submissions:** Every student is advised to submit any five disease specimens/algae.

-----

**GULBARGA UNIVERSITY KALABURAGI**  
**B.Sc. I SEMESTER, BOTCC-1, BOTANY PRACTICAL EXAMINATION MODEL PAPER**

Time: **2.Hrs.**

**Paper-1**

Max.Marks: **40**

---

- |   |           |
|---|-----------|
| 1. Stain the given material 'A' by positive staining using Safranin/Crystal violet.<br>Write procedure and Identify with reasons.   | <b>05</b> |
| 2. Identify, giving reasons of followings specimens <b>B</b> -algae/Cyanobacteria, <b>C</b> -Algae,<br><b>D</b> -Fungi\Lichen.  | <b>09</b> |
| 3. Identify the specimen and draw labeled diagram with reasons. <b>E</b> - Viral/Bacterial disease,<br><b>F</b> -Fungal disease.  | <b>06</b> |
| 4. Identify the permanent slides / materials giving reasons, <b>G</b> - Cyanobacteria, <b>H</b> - Algae<br><b>I</b> - Algae <b>J</b> - Fungi, <b>K</b> – Fungi/lichens, <b>L</b> - Biopesticide | <b>15</b> |
| 5. Records / submission.  | <b>05</b> |

**Total- 40**

---

## B.Sc. II. SEMESTER, CBCS, BOTANY SYLLABUS

### PAPER-2: BOTCC-2, BRYOPHYTES PTERIDOPHYTES GYMNOSPERMS AND MORPHOLOGY OF ANGIOSPERMS. 60.Hrs

#### Unit-I 15hrs

**Introduction to Archegoniate:** Unifying features of archegoniates, transition to land habit, alternation of generations.

**Bryophytes:** General characteristics and classification of Bryophytes, Morphological, anatomical features and reproduction in – *Marchantia*, *Anthoceros* and *Funaria*. Economic importance of bryophytes. Evolution of Sporophytes in bryophytes.

#### Unit-II 15hrs

**Pteridophytes:** General characteristics and classification, morphology, anatomy and reproduction of *Selaginella*, *Equisetum* and *Marsilea*. Heterospory and seed habit. Economic importance of Pteridophytes.

**Paleobotany:** Introduction to paleobotany, Geological time scale, types and process of fossilization. Brief history and contribution of *Birbal sahani*, in the field of Paleobotany. Study of fossil plants: *Rhynia*, *Calamites*.

#### Unit-III 10hrs

**Gymnosperms:** General characteristics, classification, morphology, anatomy and reproduction of *Cyca*, *Pinus* and *Gnetum*. Economic importance of gymnosperms.

#### Unit-IV 20hrs

##### Morphology of Angiosperms

**Morphology:** Dicot and Monocot plant, **Root:** Characteristics, functions and types (Tap root Adventitious roots) Root modifications: for storage, support & vital functions (photosynthetic, respiratory, haustorial & epiphytic), **Stem:** Characteristics functions, Stem modification: Underground, Sub aerial and Aerial modifications. **Leaf:** Structure, phyllotaxy, simple and compound leaves (types), Stipules: types with example. Leaf modification in Insectivorous plants: (*Drosera*, *Utricularia* and *Nepenthes*). **Inflorescence:** Racemose, Cymose and special with examples. **Flower:** Structure of a typical flower: Calyx, Corolla Androecium, Gynoecium **Fruit:** structure and classification: Simple, Aggregate and Composite fruits.

---

#### Reference Books:

1. **B. R. Vashishta, A. K. Sinha & Kumar.** Botany For degree students, Bryophytes **S. Chand** Publications.
2. **Chopra R.N.** Biology of Bryophytes., Willey eastern ltd., New Delhi 1988
3. **Gangulee & Kar** , College Botany Vol-II., New Central Book agency, Kolkatta 1993
4. **Vashista B.R.** Bryophytes, S.Chand & Co. New Delhi 2006.

5. **Singh, Pandey & Jain** Pteridophyta, Gymnosperm & Paleobotany. Rastogi Publication, Meerut.
6. **S. Sundarajan**, College Botany, Vol. II. Himalaya Publishing house, New Delhi.
7. **D. P. Sharma** Text Book of Pteridophytes. Macmillan India Ltd. New Delhi.
8. **Sunder Rajan** Introduction to Pteridophytes. New Age International Publishers, New Delhi.
9. **Shreevasthav H.** Text Book of Gymnosperms, S. Chand & Com New Delhi.
10. **Vashishta P. C.**, Gymnosperms, S. Chand Co. Ltd. New Delhi.
11. **Mishra S. P. & Shukla A. C.** Essentials of Paleobotany, Vikas Publishing House New Delhi.
12. **Rashid.** Pteridophytes. Vikas Publishing House New Delhi.
13. **Datta A.C** (2006) Botany for Degree Students, Revised Oxford University Press.

### PRACTICALS:

- 1) **Staining techniques:** Preparation of stain: Aqueous and alcoholic (Safranin and fast green)
- 2) **Study of Pteridophytes:** Critical study of Morphological, anatomical and reproductive structures of *Selaginella Equisetum Marsilea*.
- 3) **Study of Paleobotany:** Study of Fossil specimens and slides of, *Rhynia, Calamites*.
- 4) **Study of Gymnosperms:** Critical study of Morphological, anatomical and reproductive structures in *Cycas* (corolloid root, T.S. of leaflet, Male cone and female cone) *Pinus* (T.S. of needle, and L.S. of male cone and female cone, seed) *Gnetum* (T.S. of Stem & Leaf, L.S of male cone and female cone, ovule and seed)
- 5) **Study of Angiosperms Morphology:** Study of Monocot and Dicot plants.
- 6) **Vegetative and floral morphology:** Study of specimens of morphological interests based on theory (Root, stem, leaf, inflorescence, flower, fruit, of fresh and preserved specimens.

-----

### GULBARGA UNIVERSITY KALABURAGI

#### B.Sc. II.SEMESTER, BOTCC-2 BOTANY PRACTICAL EXAMINATION MODEL PAPER

Time: 2.Hrs.	<b>Paper-2</b>	<b>Max.Marks: 40</b>
1. Identify & classify the specimens giving reasons. A. (Bryophytes); B. (Pteridopytes); C. (Gymnosperms)		<b>09</b>
2. Describe the anatomy of Specimens. D (Pteridophytes); E (Gymnosperms)		<b>08</b>
3. Identify and comment on the slides. F (Bryophytes), G (Pteridopytes), H (Gymnosperms), I (Fossil),		<b>10</b>
4. Identify and describe the specimens E, F, G, H (Morphology)		<b>08</b>
5. Records/Submission.		<b>05</b>
		-----
	<b>Total -</b>	<b>40</b>

## B.Sc. III. SEMESTER, CBCS, BOTANY SYLLABUS

### PAPER-3: BOTCC-3, (TAXONOMY, ECONOMIC BOTANY AND ETHNOBOTANY)

60 Hrs

#### Unit-I

15hrs

**General taxonomy:** Angiosperms, brief history, characteristics and scope of taxonomy. Herbarium: technique and importance of herbaria. Botanical Gardens; concept Botanical gardens of India, world and importance. Study of Floras and importance. Angiosperm Phylogeny Group (APG) and brief account on BSI and its activity.

**Botanical nomenclature:** Plant nomenclature, types of classification, artificial, phylogenetic and natural system. Binomial system of nomenclature, taxonomic evidences and brief account on Chemotaxonomy, Palynotaxonomy, Numerical taxonomy, their significance. Brief outline of ICN (ICBN), rules and principles for plant nomenclature.

#### Unit-II

20hrs

**Classification:** Salient features of plant classification, Linnaeus systems, Bentham and Hooker and Engler and Prantle, system and merits and demerits of these systems. Study of flowering plants as illustrated by following families according to Bentham and Hooker system of classification: **Dicotyledons:** a) **Polypetalae:** Brassicaceae, Malvaceae, Rutaceae, Myrtaceae, Leguminosae (sub families: Papilionaceae, Caesalpinaceae, Mimosaceae), Cucurbitaceae, Apiaceae.

#### Unit-III

10hrs

b) **Gamopetalae:** Rubiaceae Apocynaceae, Asteraceae, Asclepiadiaceae, Solanaceae, Acanthaceae, Lamiaceae.

c) **Monochlamydae:** Amaranthaceae, Euphorbiaceae. **B) Monocotyledons:** Liliaceae, Arecaceae, Poaceae.

#### Unit-IV

15hrs

##### Economic botany:

Introduction and economic importance of followings: Mention botanical names, Family, part used and uses) a) **Spices:** Cardamom, Clove, Cinnamomum, Pepper, Turmeric. b) **Narcotic plants:** *Cannabis sativa* & *Papaver somniferum*. c) **Beverages:** Coffee, Tea, d) **Medicinal & Aromatic plants:** *Rauwolfia*, (*Sarpa gandha*), *Withania*, (*Ashwagandha*) *Azadirachta* (Neem) & *Aloe* (kumari), *Mentha* (mint) and *Stevia*, e) **Biofuels:** *Jatropha*, *Pongamia* f) **Fruits:** *Mango*, *Banana*, *Grapes*, *Papaya*. g) **Masticatories & Fumitories:** Tobacco & Health hazards.

**Ethnobotany:** Introduction, Definition, concept and importance in the field of medicine used in daily life. A brief account on *Soliga* tribe of Karnataka. **Sacred grooves:** Introduction, concept, significances and threats to sacred grooves.

---

#### Reference Books:

1. Kormondy, E.J. (1996). Concepts of Ecology. Prentice Hall, U.S.A.



2. **Simpson, M.G.** (2006). *Plant Systematics*. Elsevier Academic Press, San Diego,U.S.A.
3. **Singh, G.** (2012). *Plant Systematics*: Oxford & IBH Pvt. Ltd., New Delhi.
5. **Pande, Singh and Jain**, *Taxonomy of Angiosperm*. Rastogi Publication Meerut.
6. **Sundarrajan**, *Plant Taxonomy*. New Age International Publishers, New Delhi
7. **Saxena. Saxena**: *Plant Taxonomy*. Rastogi Publication Meerut.
8. **B.P Pandey**: *Angiosperms* S. Chand Co. Ltd. New Delhi

**PRACTICALS:**

1. **Systematic study of families**: the study of plants based theory (2 plants from each family) using local floras.
2. **Herbarium Technique**: Prepare herbarium of available plant species.
3. **Study of economic botany**: The study of economic plants based on theory.
4. **Identification of selected taxa**: By using taxonomic key's
5. **Submission**: Five herbariums of different flowering plants.
6. **Visiting**: Visit to nearby forests/Botanical Gardens (submission of Botanical report)
7. **Study of technical terms**: From the local plant specimens.

-----

**GULBARGA UNIVERSITY KALABURAGI**

**B.Sc. III.SEMESTER,BOTCC-3, BOTANY PRACTICAL EXAMINATION MODEL PAPER**

Time: <b>2.Hrs.</b>	<b>Paper-3</b>	<b>Max.Marks: 40</b>
	1. Assign the plants <b>A,B,C,D</b> to their respective Families giving important characters	16
	2. Give the Floral Formula and Diagram of Specimen <b>E</b>	05
	3. Identify and mention the Economic Importance of Specimens <b>F,G &amp; H</b>	09
	4. Describe the specimen ' <b>I</b> ' (in technical terms)	05
	5. Records and submissions	05
-----		
<b>Total</b>		<b>-40</b>

-----

## B.Sc. IV. SEMESTER, CBCS, BOTANY SYLLABUS

### PAPER-4:BOTCC-4, PLANT ANATOMY, EMBRYOLOGY OF ANGIOSPERMS, ECOLOGY AND BIODIVERSITY. 60.hrs

#### Unit-I

15hrs

**Plant Anatomy:** *Meristematic and permanent tissues:* Shoot apical Meristems, brief account of *simple* and complex permanent tissues. Tissue system in plants: Epidermal (trichomes and types of stomata), Secretary tissue, Vascular tissue system and types of vascular bundles.

*Plant organs:* Anatomy of Dicot: Stem, root and Leaf (Sunflower) Anatomy of Monocot: stem, root and leaf (Maize). *Secondary Growth:* Normal secondary growth in Dicot stems (Stelar and extra stelar). Wood, (heartwood and sapwood). Anomalous secondary growth in *Boerhavia, Achyranthes*.

#### Unit-II

18hrs

**Embryology of Angiosperm:** *Introduction,* General account on Plant embryology, Indian embryologists: *B.G.L.Swamy and P. Maheshwari*, brief history and contributions. Structural organization of flower: Structure of typical flower and parts. Anther development: Microsporogenesis, male gametophyte. Palynology, general account on pollen morphology (pollen characters) and its role in taxonomy. Ovule development: Megasporogenesis: Female gametophyte, organization(structure) of mature embryo sac. (Polygonum type). Types of embryosacs: Monosporic (Polygonium), Bisporic (Allium) and Tetrasporic (Adoxa) .Structure of mature ovule (Anatropous) and types of ovules.

*Pollination and fertilization:* Pollination Self and cross pollination, Contrivances /adaptations for self and cross pollinations and significance. Agents and characters of cross pollination flowers. Pollen-pistill interactions (brief). *Fertilization:* Fertilization double fertilization, triple fusion, progamy, chalazogamy and mesogamy. *Endosperm and Embryo:* Formation and development endosperm, types (cellular, helobial and free Nuclear).Structure of Dicot Embryo (Cruciform):Polyembryony and Apomixis: General account, definition types and practical applications. Seed: Structure of Dicot & Monocot seed, appendages and dispersal mechanisms in seeds.

#### Unit-III

15hrs

**Plant Ecology:** Introduction and scope, Dynamics of environmental factors, water, air, light temperature and soil. Role of climate in soil development, soil profile. Components of ecosystem: types of ecosystem, food chains & food web. Tropic organization, ecological pyramids types, energy flow models. A brief account on Ecotone and edge-effect. Bio-geochemical cycles, Carbon cycle, Nitrogen cycle and Phosphorous cycle. Plant process of succession: Xerosere, Hydrosere. Ecological adaptations in plants (Morphological and Anatomical): *Hydrophytes, xerophytes, Halophytes, Epiphytes*, and brief account on *Parasitic angiosperm*.

#### Unit-VI

12hrs

**Biodiversity and Conservation:** Biodiversity, definition, current concept and status in India. Types of biodiversity, *Keystone species, Hot spots, Endemic species, endangered species, Red Data Book*. Forest: introduction, types and importance. *Geological Information System (GIS)*, Remote sensing and its application in resource identification i.e. (Biodiversity & water management). Biosphere resources. Ex situ & In situ conservation, National park, wild life sanctuaries. Cryopreservation: Seed bank & Gene bank. Brief history and activities of, IUCN, WWF, & BNHS. *Phytogeography*. Definition scope and importance, Floristic regions of India (Botanical regions) and Vegetation of Karnataka.

### Reference Books:

1. **Esau K.** Plant Anatomy. Wiley Eastern New Delhi.
2. **Sen D. N.** Anatomy of Angiosperms. Nagini & Co.
3. **P. C. Vashishta.** Plant Anatomy Pradeep Publications Jalandhar
4. **B.P Pandey:** Plant Anatomy S. Chand Co. Ltd. New Delhi
5. **Ambashat.R.S.** A Text book of Plant Ecology. Students Friends Co Varanasi
6. **Bhojwani S S. & Bhatnagar S P.**The Embryology of Angiosperms. Vikas publishing House Pvt. Ltd. New Delhi.
7. **Pandey B P.** Embryology of Angiosperms. S.Chand Publication New Delhi.
8. **V.Singh,Pandey and Jain.** Embryology of Angiosperms. Rastogi Publication Meerut.
9. **Datta A.C.** Botany for Degree Students, Revised Oxford University Press
10. **Sundarajan.S.** College Botany Vol III Himalaya Publishing House. New Delhi.
11. **P.K Gupta.** Methods of Environmental analysis. Agro Bios Publication, Jodhpur.
12. **Agarwal K.C.** Biodiversity. Agro Bios Publication, Jodhpur.
13. **Shukla& Chandel.** Plant Ecology S. Chand Co. Ltd. New Delhi
14. **P.D.Sharma.** Ecology and Environment. Rastogi Publication Meerut

### PRACTICALS:

1. **Study of tissue:** (fresh mount/permanent slides), Meristematic tissue Parenchyma, collenchymas, sclerenchyma and xylem.
2. **Maceration technique:** Observation of tissues and types of Sclereids and vessels
3. **Microscopic studies:** Stomata, Monocot and dicot and epidermal hairs (Tridax/Vinca)
4. **Anatomical study:** Study of permanent slides and specimens of following by making double stained temporary slides. Anatomy of Young Dicot stem: T.S. of Sunflower Anatomy of Young Dicot root: T.S. of Sunflower. Anatomy of Monocot Stem: T.S. of Grass/Maize Anatomy of monocot Root.T.S, of Grass/Maize. Anatomy of Dicot Leaf.T.S. of Sunflower/Bengal gram. Anatomy of Monocot Leaf: T.S. of Grass/Maize. Anatomical studies of anomalous secondary structures by making double stained temporary/permanent slides in the following T.S. of Stem of *Boerrhavia*. and *Achyranthes*.
5. **Study of Anthers:** Microsporogenesis (Permanent Slides)
6. **Study of Ovule:** Megasporogenesis/Female gametophyte (Permanent slides)
7. **Mounting of Pollen grains:** (available flowers) Vinca, Legumes, Hibiscus.
8. **Types of Placentation:** (Permanent slides)
9. **Endosperm Mounting:** Cucumis/Croton/Tridax
10. **Pollen Germination:** By “Hanging Drop Method”
11. **Study of embryo development:** Heart shaped dicot embryo in chilli (permanent slides).Study of embryo of any monocot (Live specimens and permanent slides).

**12. Study of plant community:** By determining frequency, density and abundance by quadrat method

**13. Morphological & Anatomical adaptations:** of Hydrophytes, Xerophytes, halophytes & epiphytes.

**14. Study of pH:** Study of P<sup>H</sup> in soil & water.

**15. Ecological Instruments:** Anemometer, Rain gauge, Maximum & Minimum thermometer, Dry & wet Bulb thermometer, Hygrometer, Soil thermometer.

**16. Identification of:** Endangered & Endemic species photographs.

**17. Air Sampling:** To determine Air born pollen grains & fungal spores.

**18. Study tour:** Every student has to undertake the compulsory trip at least for 4 days to study vegetation & submit report.

**19. Project work:** Every student has to submit project report.

---

**GULBARGA UNIVERSITY KALABURAGI**  
**B.Sc. IV.SEMESTER,BOTCC-4, BOTANY PRACTICAL EXAMINATION MODEL PAPER**

Time: **2.Hrs.**

**Paper-4**

**Max.Marks: 40**

- |   |           |
|---|-----------|
| 1. Prepare a temporary safranin stained T.S. of material, <b>A</b> , and identify with reasons leave the preparation for observation/valuation  | <b>08</b> |
| 2. Mount the endosperm/embryo of <b>'B'</b> . Sketch and label the parts and leave the Preparation for evaluation.  | <b>06</b> |
| 3. Mount/Take the T.S. of the given material <b>'C'</b> . (Pollen grains,/pollenia,/ placentation.) Sketch and label the parts.   | <b>03</b> |
| 4. Identify and assign the plant to respective ecological group with neat labeled Diagrams giving reasons. <b>'D'</b> (Morphological and anatomical)  | <b>08</b> |
| 5. Identify the micro slides/ instrument /photography with reasons <b>'E'</b> - Anatomy, <b>F'</b> - Embryology, <b>G'</b> - Ecology, <b>H'</b> - Ecological instrument, <b>I'</b> - Endemic/endangered sp. | <b>10</b> |
| 6. Record/ submission:  | <b>05</b> |

-----  
**Total - 40**

## B.Sc. V. SEMESTER, CBCS, BOTANY SYLLABUS

### PAPER-5.1: BOTDSE-1 CYTOLOG, MOLECULAR BIOLOGY, GENETICS, PLANT BREEDING AND PLANT PROPAGATION. 60.hrs

#### Unit-I

15hrs

**Cytology (Cell biology):** Introduction and scope of cytology, cell theory, comparative study of prokaryotic and eukaryotic cell. **Plant cell:** structure and functions of cell organelles. Ultra structure of cell wall and cell membrane (Fluid mosaic model). Endoplasmic reticulum, Plastids (Chloroplast), Golgi complex, Mitochondria and Nucleus. Chromosomes: Structure, types and function, ultra structure of chromosome. Giant Chromosomes: Salivary gland and Lamp brush chromosomes. Cell division, cell-cycle, stages of Mitosis, Meiosis and Significance. Chromosomal aberration: (deletion duplication translocation inversion), Numerical variations in chromosomes, (Euploidy and aneuploidy.). Karyotype & ideogram.

#### Unit-II

10hrs

**Molecular Biology:** Introduction, Nucleic acids: History and discovery, DNA, structure, chemical composition, models and functions. RNA: structure, chemical composition, types and functions. DNA replication by semi conservative method. Experimental evidences to prove DNA as genetic material. Genetic code- meaning, properties and protein synthesis. Gene: concept of gene, structure of prokaryotic and eukaryotic genes, Regulation of genes, (Lac-operon concept). Mutations: Spontaneous & induced mutations and significance.

#### Unit-III

20hrs

**Genetics:** Introduction, brief history of Mendalian genetics, Monohybrid and di-hybrid crosses, principle and terminology. Gene-interaction with suitable examples of followings, *incomplete dominance, complementary, supplementary, epistasis, and polygenic inheritance*. (Solve genetic problems on dihybrid and interaction of genes). Cytoplasmic inheritance (Leaf variegation in *Mirabilis jalapa*), Multiples alleles (Coat colour in Rabbit), pleiotropism. Sex determination, chromosome theory of sex determination (XX-XY) in *Drosophila* and *Melandrium*. Sex linked inheritance in *Drosophila*: Linkage and Crossing over, process in Maize.

#### Unit-IV

15hrs

**Plant Breeding:** Introduction, aims and objectives of plant breeding. Methods of crop improvements, i.e. Selection, Hybridization (intra specific and inter specific hybridization), Plant introduction & acclimatization, Mutation and polyploidy breeding. Hybridization technique. Domestication of crop plants and crop genetic resources. Plant breeding centers in India and contributions.

**Plant propagations:** Introduction, methods of plant propagations through seeds, cuttings, roots, corms, bulbs, rhizome and leaves cuttings, layering, gooting, budding and grafting.

-----  
**Reference Books**

1. **Karp, G.** Cell and Molecular Biology: Concepts and Experiments. John Wiley & Sons.
2. **De Robertis, E.D.P. and De Robertis, E.M.F.** Cell and Molecular Biology.
3. **Cooper, G.M. and Hausman, R.E.** The Cell: A Molecular Approach. ASM Press, Sunderland.
4. **Becker, W.M., Kleinsmith.** The World of the Cell. Pearson Benjamin Cummings Publishing, USA.
5. **P K Gupta.** Genetics. Rastogi Publication Meerut.
6. **P K Gupta.** Cytology, Genetics. Rastogi Publication Meerut.
7. **Singh and Tomer:** Cell biology. Rastogi Publication Meerut
8. **Verma Agarwal.** Cytology, genetics and evolution. S. Chand & Co New Delhi.
9. **C.B Pawar.** Cell Biology; Himalaya. Publication. Mumbai.
10. **V. Kumaresan** Plant breeding. Saras Publication.
11. **R.L. Kotpal.** Concept of Genetics. Rastogi Publications. Meerut.
12. **Sinnut Dunn.** Principles of Genetics, Tata McGraw-Hill Publishers, New Delhi.
13. **Sharma, J.R.** Principles and Practice of Plant Breeding, Tata McGraw Hill Publishers, Delhi.

**PRACTICALS:**

1. **Study of prokaryotic cells:** (bacteria), eukaryotic cells with the help of microscope.
2. **Study of plant cell:** By temporary mounts. Cell organelles by photomicrograph.
3. **Study of mitosis and meiosis:** By squash and smear methods in onion roots & flower buds, (temporary mounts and permanent slides).
4. **Measurement of cell size:** By micrometry.
5. **Study of special chromosomes:** (polytene & lampbrush) either by slides or photographs.
6. **Study DNA packaging:** By micrographs.
7. **Preparation of karyotype and ideogram:** By given photograph of metaphase chromosome
8. **Genetic problems:** based on theory ie. Dihybrid cross and interaction of genes.
9. **Study of dimorphic chloroplast:** In Euphorbia hirta/C4 plant (sugarcane),
10. **Micro-chemical tests:** For Cellulose, lignin, Protein (Procedure), Cystoliths and Raphides.
11. **Hybridization techniques:** In self pollinated and cross pollinated plants-Maize
12. **Plant propagation:** Methods of plant propagations based on theory.

-----

**GULBARGA UNIVERSITY KALABURAGI**

**B.Sc. V.SEMESTER, BOTDSE-1, BOTANY PRACTICAL EXAMINATION MODEL PAPER**

Time: **2.Hrs.**

**Paper-5.1**

**Max.Marks: 40**

- |   |           |
|---|-----------|
| 1. Make a squash / smear preparation of specimen 'A'. Identify, Sketch and label any two stages and show the preparation to the examiner.       | <b>08</b> |
| 2. Make a cytological preparation of specimen 'B' to observe the dimorphic chloroplast. Sketch, label and show the preparation to the examiner. | <b>06</b> |
| 3. Solve the given genetic problem 'C'  | <b>06</b> |
| 4. Demonstrate and write the procedure of hybridization technique in the specimen 'D'   | <b>05</b> |
| 5. Demonstrate the technique of Gooting, Cutting, Layering, Budding in the specimen E,  | <b>05</b> |
| 6. Identify and comment on Slides, F&G, (Mitosis & Meiosis)   | <b>05</b> |
| 7. Records and Submission   | <b>05</b> |

-----  
**Total Marks 40**

**B.Sc. V. SEMESTER, CBCS, BOTANY SYLLABUS  
PAPER-(BOTSEC- 5.2.1): BIOFERTILIZERS.**

**15 h**

**Unit I:**

**7h**

General account about the microbes used as biofertilizer: Isolation and Identification of Rhizobium , *Azospirillum*, *Azotobacter*, Cyanobacteria (blue green algae), *Azolla* and *Anabaena*. Nitrogen Fixation by Rhizobium, factors affecting growth of blue green algae and *Azolla* in rice cultivation.

**Unit II:**

**8h**

Mycorrhizal association, types of mycorrhizal association, colonization of VAM – isolation and inoculum production of VAM, and its influence on growth and yield of crop plants. Organic farming – Green manuring and organic fertilizers. Recycling of biodegradable municipal, agricultural and Industrial wastes – biocompost making methods, types and method of vermicomposting – field Application.

**Reference Books:**

- 1. Dubey, R.C.** A Text book of Biotechnology S.Chand & Co, New Delhi.
- 2. Kumaresan, V.** Biotechnology, Saras Publications, New Delhi.
- 3. John Jothi Prakash, E.** Outlines of Plant Biotechnology. Emkay. \_Publication, New Delhi.
- 4. Sathe, T.V.** Vermiculture and Organic Farming. Daya publishers.
- 5. Subha Rao, N.S.** Soil Microbiology, Oxford & IBH Publishers, New Delhi.
- 6. Vayas,S.C, Vayas, S. and Modi, H.A.** Bio-fertilizers and organic Farming Akta Prakashan,

**PRACTICALS:**

1. Isolation and identification of bacterial biofertilizers
  2. Mass culture of *Azolla*
  3. Effect of *Azolla* on plant growth
  4. Isolation of VAM
  5. Preparation of green manure and its impact on crop growth
  6. Preparation of Vermicompost and its impact on crop growth
  7. Visit to composting units.
-

**B.Sc. V. SEMESTER, CBCS, BOTANY SYLLABUS  
PAPER-(BOTSEC- 5.2.2): HERBAL TECHNOLOGY.**

**15.Hrs**

**Unit I**

**7h**

**Herbal medicines:** history and scope - role of medicinal plants in Ayurveda and Siddha systems of medicine; cultivation - harvesting - processing - storage -marketing and utilization of medicinal plants.

**Phytochemistry** - active principles, phytochemical screening tests for secondary metabolites (Alkaloids, flavonoids, steroids, triterpenoids, phenolic compounds).

**Unit II**

**8h**

**Pharmacology:** Medicinal uses of *Ocimum sanctum*, *Zingiber officinale*, *Saraca asoca*, *Catharanthus roseus*, *Tribulus terrestris*, *Terminalia arjuna*, *Hemidesmus, indicus* and *Centella asiatica*. Methods of screening plant crude drugs against microbial pathogens. Drug adulteration, methods of drug storage and microbial drug contaminations.

**PRACTICALS:**

1. Collection and identification of local medicinal plants
2. Cultivation of medicinal plants
3. Qualitative screening of secondary metabolites
4. Quantitative analysis of secondary metabolites
5. Extraction of secondary metabolites using Soxhlet
6. Antimicrobial activity of medicinal plants.
7. Visit to medicinal plant garden.

**Reference Books:**

1. **R.N.Chopra, S.L.Nayar and I.C.Chopra.** Glossary of Indian medicinal plants, New Delhi.
  2. **Kanny, Lall, Dey and Raj Bahadur,.** The indigenous drugs of India, International Book Distributors.
  3. **Arber.** Herbal plants and Drugs. Mangal Deep Publications.
  4. **V.V. Sivarajan and Balachandran.** Ayurvedic drugs and their plant source. Oxford IBH publishing Co.
  5. **Miller, Light and Miller, Bryan.** Ayurveda and Aromatherapy. Banarsidass, Delhi.
  6. **Thomsons, London.** Principles of Ayurveda, Anne Green. Thomsons, London.
  7. **C.K.Kokate.** Pharmacognosy, Nirali Prakashan.
-



## B.Sc. VI. SEMESTER, CBCS, BOTANY SYLLABUS

### PAPER-6.1:BOTDSE-2 PLANT PHYSIOLOGY, METABOLISM AND PLANT BIOTECHNOLOGY. 60hrs

#### Unit I

15h

**Plant-water relations:** Importance of water to plant life. Physical processes of water absorption: Imbibition, diffusion, osmosis, plasmolysis, water potential and its components; Ascent of Sap: meaning, mechanism and theories; vital theory, pulsatory and root pressure, physical theory, transpiration pull theory. Transpiration: types, structure of stomatal apparatus. Mechanism of opening and closing of stomata, theories, Starch sugar inter-conversion, Active proton or (K<sup>+</sup>) transport concept and significance; Factors affecting transpiration; Guttation, structure of hydathodes.

**Mineral nutrition:** Essential elements, macro and micronutrients; Criteria of essentiality of elements; Role of essential elements, Soilless growth: (hydroponics) and significance; Transport of ions across cell membrane, active and passive transport, carriers, channels and pumps.

**Translocation in phloem:** Composition of phloem sap, girdling experiment; Munch's Mass flow hypothesis. Phloem loading and unloading.

#### Unit II

15h

**Enzymes:** Classification, Structure, properties and Mechanism of enzyme action and enzyme inhibition.

**Photosynthesis:** Introduction, Photosynthetic pigments (Chl a, b, xanthophylls, carotene); Photosystem I and II, reaction center, antenna molecules; Mechanism of photosynthesis-light reaction, cyclic and non cyclic photophosphorylation. Dark reaction: C<sub>3</sub>, C<sub>4</sub> cycles, CAM. & Photorespiration. Law of limiting factors.

**Respiration:** Introduction, types of respiration, Glycolysis, anaerobic respiration, TCA cycle; Oxidative phosphorylation, Glyoxylate, Oxidative Pentose Phosphate Pathway.

#### Unit III

15h

**Nitrogen metabolism:** Introduction, Biological nitrogen fixation; Nitrate and ammonia assimilation.

**Plant growth regulators:** Growth, sigmoid curve, Discovery and physiological role growth regulators, Auxins, Gibberellins, Cytokinins, Ethylene.ABA.

**Plant response to light and temperature:** a) Photoperiodism, types of plants (Short day, long day and day neutral plants). Brief note on Phytochrome and importance of photoperiodism. b)Vernalization, introduction, mechanism and importance.

#### Unit IV

15h

**Plant-Biotechnology:** Introduction and scope of biotechnology, Application of Biotechnology, Transgenic plant- Bt-cotton and Golden rice, **Genetic engineering:** Introduction, tools used in genetic engineering Recombinant DNA technology (Steps of r-DNA technology): DNA Fingerprinting, PCR technique, Hybridoma technique, ELISA test, and gene therapy. Plant tissue culture: Media preparation, Steps involved in tissue culture.

-----

#### Reference books

1. **V.K Jain.** Fundamentals of Plant Physiology, S.Chand & Company New Delhi
2. **P.S.Gill.** Plant Physiology. S.Chand & Company New Delhi
3. **H.Shrivastav.** Plant Physiology. Rastogi Publication Meerut.

- 4 **Bajracharya, D.** Experiments in Plant Physiology- A Laboratory Manual. Narosa Publishing House, New Delhi.
5. **P.K Gupta.** Elements of Biotechnology. Rastogi publication Meerut.
6. **Duby.** A text book Biotechnology. S. Chand & com. New Delhi.
7. **Delvin R.M.** Plant physiology. East & West, Co. New Delhi.
8. **Bendre and Kumar.** Practical botany, Rastogi Publication Meerut.
9. **B,P.Pandey.** Modern practical Botany Vol III, S.Chand, Co, New Delhi.

### **PRACTICALS:**

#### **Biochemical/ analysis methods of physiology experiments:**

1. Determination of osmotic potential of plant cell sap by plasmolytic method.
2. Study of two environmental factors (light and wind) on transpiration by excised twig.
3. Calculation of stomatal index and stomatal frequency of in mesophytes and xerophytes.
4. Demonstration of Hill reaction.
5. Experiment to show activity of catalase and study the effect of p<sup>H</sup> and enzyme concentration.
6. To show of respiratory enzymes in plant tissue.
7. To show presence of starch in chloroplast.
8. To study the effect of light intensity and bicarbonate concentration on O<sub>2</sub> evolution in photosynthesis.
9. Comparison of the rate of respiration in any two parts of plant.
10. Separation of amino acids by paper chromatography.
11. Separation of chlorophyll by paper chromatography.

#### **Demonstration of physiology experiments:**

1. Imbibition, Osmosis, Plasmolysis.
2. Transpiration and Guttation.
3. Root pressure.
4. Photosynthesis
5. Respiration
6. Effect of auxins on rooting and bolting.
7. Growth
8. Phototropism. & Geotropism.

**Biotechnology experiments:** Study of transgenic plants: BT-Cotton, Golden rice. Plant tissue culture technique and apparatus. DNA isolation from Coconut endosperm.

-----

### **GULBARGA UNIVERSITY KALABURAGI**

#### **B.Sc. VI SEMESTER, (BOTDSE-2), BOTANY PRACTICAL EXAMINATION MODEL PAPER**

Time: 2.Hrs.

**Paper-6.1**

**Max. Marks: 40**

- |  |           |
|--|-----------|
| 1. Perform the assigned physiology (analysis/biochemical) expt. 'A' record your observation and Show to examiner.                      | <b>09</b> |
| 2. Demonstrate assigned physiology expt. 'B' and show its record to examiner   | <b>07</b> |
| 3. Demonstrate the experiment and write protocol on C, or, conduct/ demonstrate DNA isolation from the given material. (Biotechnology) | <b>07</b> |
| 2. Identify and comment on (Physiology) 'D', 'E', 'F' and 'G' (Biotechnology) 'H' & 'I'  | <b>12</b> |
| 3. Submission of Records.  | <b>05</b> |

-----  
**Total - 40**

**B.Sc. VI. SEMESTER, CBCS, BOTANY SYLLABUS  
PAPER-BOTSEC-6.2.1: NURSERY AND GARDENING.**

**15h**

**Unit 1:**

**7h**

**Nursery:** Introduction, infrastructure for nursery, planning and seasonal activities - Planting - direct seeding and transplants. Seed: Seed dormancy; causes and methods of breaking dormancy, Seed storage and seed testing. Sowing/raising of seeds and seedlings - Transplanting of seedlings.

**Vegetative propagation:** Selection of cutting, collecting season, treatment of cutting, rooting medium and planting of cuttings - Hardening of plants – green house - shade house and glass house.

**Unit 2:**

**8h**

**Gardening:** Definition, objectives and scope - different types of gardening - landscape and home gardening - parks and its components - plant materials and design - computer applications in landscaping - Gardening operations. Study of cultivation of different vegetables: cabbage, brinjal, lady's finger, onion, garlic, tomato and carrots – storage and marketing.

**PRACTICALS:**

1. Testing and breaking of seed dormancy
2. Seed germination and viability
3. Study of efficacy of natural fungicides.
4. Vegetative propagation, layering and cuttings.
5. Testing of seed borne diseases.
6. Cultivation of vegetables.
7. Visit to nursery and green houses.

**Reference Books**

1. **Bose T.K. & Mukherjee, D.** Gardening in India, Oxford & IBH Publishing Co. Delhi.
  2. **Sandhu, M.K.,** Plant Propagation, Wiley Eastern Ltd., Bangalore, Madras.
  3. **Kumar, N.** Introduction to Horticulture, Rajalakshmi Publications, Nagercoil.
  4. **Edmond Musser & Andres.** Fundamentals of Horticulture, McGraw Hill Book Co., New Delhi.
  5. **Agrawal, P.K.** Hand Book of Seed Technology, Dept. of Agriculture and Cooperation, National Seed Corporation Ltd., New Delhi.
  6. **Janick Jules. 1979.** Horticultural Science. (3rd Ed.), W.H. Freeman and Co., San Francisco, USA.
-

**B.Sc. VI. SEMESTER, CBCS, BOTANY SYLLABUS  
PAPER- (BOTSEC-6.2.2): FLORICULTURE.**

**15h**

**Unit 1:**

**8h**

**Introduction:** Importance and scope of floriculture and landscape gardening. Ornamental Plants: Shade and ornamental plants; Ornamental bulbous plants; Cacti and succulents; Palms and Cycads; Ferns. Cultivation of plants in pots, Indoor gardening and Bonsai. Principles of Garden Designs: Features of a garden (Garden wall, Fencing, Steps, Hedge, Edging, Lawn, Flower beds; Shrubbery, Borders, Water garden. Some Famous gardens of India.

**Unit II:**

**7h**

**Commercial Floriculture:** Factors affecting flower production; Production and packaging of cut flowers; Flower arrangements; Methods to storage of cut flowers; Cultivation of Important cut flowers (Carnation, Aster, Chrysanthemum, Dahlia, Gerbera, Gladiolous, Marigold, Rose, Lilium, Orchids). Diseases and pests of Ornamental plants.

**PRACTICALS:**

1. Methods and designs of landscape for floriculture
2. Pot cultivation of flowering plants
3. Preparation for bonsai plants.
4. Methods of storage of cut flowers
5. Disease management of important ornamental plants
6. Preparation of Jam and Gulkand from rose petal.
7. Visit to Horticulture institute.

**Reference Books:**

1. **Randhawa, G.S. and Mukhopadhyay, A.** Floriculture in India. Allied Publishers.

**Model Question paper for theory examination for Core and DSE papers**

GULBARGA UNIVERSITY, KALABURAGI

B.Sc --Semester Degree Theory Examination in Botany, month, year.

Paper no:-----

**Time: 3 h**

**Max.Marks:80**

**Instruction to Candidates:** 1. Answer all the questions.  
2. Draw neat labeled diagrams wherever necessary

=====  
**I. Answer any TEN of the followings in two or three sentences** (2x10=20)

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

**II. Answer any FOUR of the followings in brief** (4x5=20)

- 13.
- 14
- 15
- 16
- 17
- 18

**III. Answer any FOUR of the followings** (4x10=40)

- 19
  - 20
  - 21
  - 22
  - 23
  - 24
- =====

**Model Question paper for internal theory examination for Core and DSE papers:**

**GULBARGA UNIVERSITY, KALABURAGI**  
**B.Sc. -- Semester Degree theory Internal Examination in Botany, month, year.**  
**Paper:-----**

**Time: 1 h**

**Max.Marks:20**

=====  
**I. Answer the followings in two or three sentences** (1x5=5)

- 1.
- 2.
- 3.
- 4.
- 5.

**II. Answer any ONE of the followings in brief** (1x5=5)

- 6.
- 7

**III. Answer any ONE of the followings** (1x10=10)

- 8
  - 9
- =====

**Model Question Paper for SEC theory examination:**

**GULBARGA UNIVERSITY, KALABURAGI**  
**B.Sc. Semester Degree theory Examination in Botany, month, year.**  
**Paper:**

**Time: 2 h**

**Max.Marks:40**

**Instruction to Candidates:** 1. Answer all the questions.  
2. Draw diagrams wherever necessary

=====

**I. Answer any FIVE of the followings in two or three sentences** (2x5=10)

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

**II. Answer any TWO of the followings in brief** (2x5=10)

- 13.

14

15

III. Answer any TWO of the followings

(2x10=20)

19

20

21

=====

**NOTE: For SCE paper there will not be internal theory examination. Instead, the candidate shall submit the report on the practical carried out during the semester for TEN (10) marks.**



**Chairman (BOS)**

**The Panel of Board of studies constituted for framing the syllabus.**

<b>SNo</b>	<b>Name</b>	<b>Position</b>
<b>1</b>	<b>Prof, G.M. Vidyasagar</b> , Chairman, Dept. of Botany, Gulbarga University, Kalaburagi.	<b>Chairman</b>
<b>2</b>	<b>Dr, Rajshekhhar S.Babanoor.</b> A.V.Patil AS&C College, Aland.	<b>Member</b>
<b>3</b>	<b>Sri, T.Mehamood.</b> L.V.D.College, Raichur.	<b>Member</b>
<b>4</b>	<b>Dr.Shaila. Hiremath.</b> S.B.Science College, Kalaburagi.	<b>Member</b>
<b>5</b>	<b>Smt. Shravani.K.A.</b> Yuvraja' s College, University College, University of Mysore. Mysuru.	<b>External member</b>