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ವಿಶ್ವವಿದ್ಯಾನಿಲಯ



BENGALURU CITY
UNIVERSITY

Office of the Registrar, Central College Campus, Dr. B.R. Ambedkar Veedhi, Bengaluru – 560 001.
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No:BCU/BoS/Botany/೧೨೨/2021-22

Date: 13.10.2021.

NOTIFICATION

Sub: Botany Syllabus for III, IV, V and VI Semesters of
Bengaluru City University.

Ref: 1. Notification of even No. dated 04.09.2020.
2. Recommendations of the Board of Studies in Botany.
3. Resolution of the Academic Council at its meeting
held on 12.10.2021.
4. Orders of the Vice-Chancellor dated 13.10.2021.

The CBCS pattern Botany Syllabus for I & II Semester students who have been admitted to B.Sc., I Semester during the academic year 2020-21 has been notified vide Notification cited at reference (1) above.

In pursuance to the recommendations of the Board of Studies in Botany and the resolution of the Academic Council, cited at reference (2) & (3) above, the CBCS pattern Botany Syllabus for III, IV, V and VI Semesters students who have admitted to B.Sc., I Semester during the academic year 2020-21 of Bengaluru City University are hereby notified for implementation .

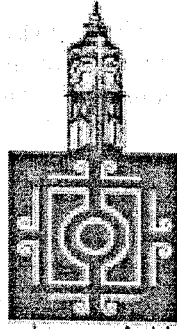
The copy of the above Syllabus are notified in the University Website: www.bcu.ac.in for information of the concerned.


REGISTRAR



To,

1. The Dean, Faculty of Science , BCU.
2. The Chairman & Members of BoS in Botany , BCU.
3. The Principals of the concerned affiliated Colleges of BCU – through email.
4. The P.S. to Vice-Chancellor/Registrar/Registrar (Evaluation), BCU.
5. Office copy / Guard file/University Website www.bcu.ac.in



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BE BOUNDLESS

BENGALURU CENTRAL UNIVERSITY

**SYLLABUS FOR B.Sc Botany
(IIIrd to VI Semester)**

**CHOICE BASED CREDIT SYSTEM
(SEMESTER SCHEME)**

2020-21 onwards

Proceedings of the meeting of BOS (UG) in Botany held on 30th September 2021 at Senate hall, Department of Commerce, Bangalore City University, Bengaluru – 560 001

Reference:

1. G.O. ED: 260/USE/2019 (part-1), Bangalore
2. Email from HEC, GOK dated
3. University order dated

Adverting to above, the drafted syllabus prepared by Higher Educational Council (HEC), Government of Karnataka (GOK) pertaining to B.Sc. Botany was circulated by online mode (mailed on 24.09.2021) to all the members of BOS.

Agenda: Approval of syllabus for B.Sc. in Botany theory and practical and scheme of examination for I and II semesters of Bangalore City University, Bangalore.

Resolution: The proposed syllabus for B.Sc. in Botany and practical, Open Elective and Scheme of Examination for I and II semesters were scrutinized thoroughly, finalized with appropriate inclusions and deletions and finally approved.

Members Present

1. Zaiba Nishanth Baun
2. Dr. Mallikarjuna P.B.
3. Dr. B.L. Manjula
4. Smt. K.R. Kavitha
5. Smt. N. Sarvamangala
6. Smt. K.S. Shailaja
7. Dr. L. Rajanna

Signature

Member	Zaiba Nishanth Baun
Member	Dr. Mallikarjuna P.B.
Member	Dr. B.L. Manjula
Member	Smt. K.R. Kavitha
Co-opted Member	N. Sarvamangala
Co-opted Member (ONLINE)	K.S. Shailaja
Chairman	Dr. L. Rajanna

30/9/21

Members Absent

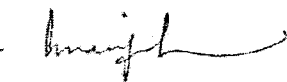
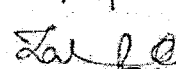
1. Dr. Deepak Bhat
 2. Dr. Jenifer lolitha
 3. Smt. Chandrakala S
- | | |
|--------|---------------------|
| Member | Dr. Deepak Bhat |
| Member | Dr. Jenifer lolitha |
| Member | Smt. Chandrakala S |

MINUTES OF THE MEETING OF BOS (UG) IN BOTANY

Chairman welcomed the members of the BoS (UG) Board to the meeting and the agenda was placed for discussion

- a. Discussed and finalized the syllabus and Scheme of examination for B.Sc. Botany (CBCS) III, IV, V and VI Semester (theory and practical) Question paper pattern, and scheme of valuation
- b. The panel of Examiners was approved and recommended for UG Examinations for the academic year 2021-22.
- c. Recommendations were made to constitute BoE for the academic year 2021-22.
- d. Discussed and finalized the syllabus for theory and practical of I and II Semester B.Sc. Botany, question paper pattern, blue print of question Paper, formative assessment and Scheme of valuation for NEP programme to be implemented from the academic year 2021-22.
- e. The Chairman was authorized to change/ incorporate the corrections as per the directions of the University.

The meeting ended with a vote of thanks by the Chairman

1. Dr. B.L. Manjula 
2. Dr. P.B. Mallikarjuna, Associate Professor, GFGC Yelahanka
3. Zaiba Nishath bano  (BSc)
4. Dr. K.R. KAVITHA K.R. Kavitha 30/9/2021
5. N. SARVAMANGALA N. Sarvamangala 30.9.21.


30/9/21

DR. L. MANJANNA
& Chairman BoS (UG)
BCU.

III SEMESTER

PAPER - III: PTERIDOPHYTES, PALEOBOTANY, ECOLOGY AND PHYTOGEOGRAPHY

52 hrs

13 hrs

UNIT I: PTERIDOPHYTES

Introduction and general character with classification (Sporne).
Study of diversity in morphology, anatomy and reproduction of the following groups in representative forms

1. Psilotopsida – Eg: *Psilotum*.
2. Lycopsidea – Eg: *Lycopodium*, *Selaginella*.
3. Filicopsida – Eg: *Marsilea*.

(Developmental stages not required)

Brief account of Telome theory, Stelar evolution, heterospory and seed habit.

13 hrs

UNIT II: PALEOBOTANY

Contribution of Paleobotanist-Birbal Sahni.

Outline of geological time scale with special emphasis on Paleozoic and Mesozoic Era. Process of fossilization– Compression, Impression and Petrification.

Type Study: *Rhynia*, *Cycadeoidea* and *Pentaxylon*.

UNIT III: PLANT ECOLOGY Part - I

13 hrs

Introduction and scope of Plant Ecology

Ecological Factors: Climatic – Light, Temperature, Rainfall, Wind and Atmospheric humidity.

Edaphic factors: Soil Formation, Soil Profile, Soil air and Soil Microorganisms

Soil Erosion: Water and Wind.

Soil Conservation:

Biological – Contour farming, Mulching, Strip cropping, Terracing and Crop Rotation.

Mechanical – Construction of dams

Soil reclamations

Biotic Factors – Positive and negative interactions.

Ecosystem – Concept, Components, Study of marine, Grassland and Cropland Ecosystems.

Ecological Succession – Hydrosere and Xerosere.

Ecological Adaptations – Hydrophytes, Xerophytes, Halophytes, Epiphytes and Parasites.

UNIT IV: PLANT ECOLOGY Part - II

13 hrs

Water Shed Management with reference to Rain water harvesting

Conservation of natural resources:

– Conservation of plant resources, Conservation of Germplasm (Quarantine)

Bio energy, Biofuels and Phyto remediation

Afforestation, Social Forestry and Agroforestry.

Conservation of plant diversity:

In-situ and *Ex-situ* Conservation – National park, Sanctuaries and Bioreserves. Role of Seed Bank and Gene Bank.

PHYTOGEOGRAPHY

Phyto-geographical regions of India, Vegetational types of Karnataka.

PRACTICAL PAPER- III

PTERIDOPHYTES, PALEOBOTANY, ECOLOGY AND PHYTOGEOGRAPHY

Total Units – 13

- Identification and Classification of Pteridophytes (examples studied in theory)
1. theory) **3 units**
 2. Paleobotany – Study of specimens and slides (fossil material/slide) **1 unit**
 3. Ecological Adaptations – Study of one example for each adaptation **2 units**
 4. Estimation of chloride and dissolved oxygen content in the given sample **2 units**
 5. Water potability test – Bacteriological test for different samples of drinking water, Calculation of most probable number **2 units**
 6. Study of Quadrat method in Ecology and studying soil sample and analysis of soil sample for structure(texture) pH etc. **2 units**
 7. Marking of vegetation types of Karnataka on Karnataka map and Phytogeographical areas of India **1 unit**
 8. Record & submissions: Submission of 3 slides of free hand sections (Pteridophytes / Ecological Specimens)

PRACTICAL QUESTION PAPER-III

PTERIDOPHYTES, PALEOBOTANY, ECOLOGY AND PHYTOGEOGRAPHY

Time: 3 Hrs

Max. Marks: 35

1. Identify and classify specimen A & B giving reasons. **2X3=6**
2. Identify the slides C, D & E with reasons and diagrams. **3X3=9**
3. Comment on slide/specimen/photocopy/photograph of F. **1X3=3**
4. Identify and comment on the Ecological adaptations of G & H (Vegetation patterns of Karnataka). **2X2½=5**
5. Estimate the Oxygen/Chloride content of the given sample/ Water potability test. **1X4=4**
6. Record and Submission **5+3=8**

SCHEME OF VALUATION

1. Pteridophytes - (Identification & classification – 1 mark, Reasons – 2 marks).
2. Pteridophytes - (Identification – 1 mark, Reasons – 1 mark, Diagram – 1 mark).
3. Fossil Material - (Identification – 1 mark, comment – 2 marks)
4. Specimen/Slide / Map - (Identification – 1 mark, comment – 1.5 marks)
5. Estimation – (Conducting experiment – 2 marks ,principle, procedure & result– 2 marks)
6. Record and Submission: 3 permanent slides of free hand sections of Pteridophytes and ecological specimens (5+3 = 8 marks).

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IV SEMESTER

PAPER-IV: GYMNOSPERMS, EMBRYOLOGY OF ANGIOSPERMS, PALYNOLOGY AND TISSUE CULTURE

UNIT - I GYMNOSPERMS

13 Hrs

General characters and classification. Economic importance of Gymnosperms with special mention of *Taxus*, *Pinus*, *Ephedra* and *Ginkgo*. Morphology and Anatomy of vegetative structures - Root, stem and leaf (primary and secondary growth), Reproductive structures (Developmental Stages not required) and life cycles of *Cycas* and *Gnetum* (Evolutionary significance of *Gnetum*)

UNIT - II EMBRYOLOGY OF ANGIOSPERMS - I

13 Hrs

Microsporangium - Development & structure of mature anther, Anther wall layers, Tapetum - types, structure & functions. Sporogenous tissue.
Microsporogenesis - Microspore mother cells, microspore tetrads, Pollinia.
Microgametogenesis - Formation of vegetative and generative cells, structure of male gametophyte. Pollen embryosa (Nemec phenomenon).
Megasporangium - Structure of typical Angiosperm ovule.
Types of ovule - Anatroous, Orthotropous, Amphitropous, Circinotropous.
Megagametogenesis - Types of development of Female gametophyte/embryosa (According to BGL Swamy) - monosporic - *Polygonum* type, bisporic - *Allium* type, tetrasporic - *Fritillaria* type. Structure of mature embryosa.

UNIT - III EMBRYOLOGY OF ANGIOSPERMS - II

13 Hrs

Double fertilization - pollen germination, growth of pollen tube through style, entry of pollen tube into ovule (porogamy, mesogamy and chalazogamy), entry of pollen tube into the embryosa, pollen tube discharge, syngamy, triple fusion. Significance of double fertilization, post fertilization changes.
Endosperm - Types and its biological importance. Free nuclear (*Cocos nucifera*) cellular (*Cucumis*), helobial types. Ruminant endosperm.
Embryogenesis - Dicot (*Capsella bursa-pastoris*) and Monocot (*Najas*).
Parthenocarpy. Polyembryony - definition and types.
Contribution of Indian Botanists - BGL Swamy and P Maheswari.

UNIT - IV PALYNOLOGY AND TISSUE CULTURE

13 Hrs

PALYNOLOGY - pollen morphology - pollen wall, aperture, shape, size and architecture, NPC system, pollen wall stratification. Applied Palynology - Aeropalynology, Mellissopalynology.
PLANT TISSUE CULTURE TECHNIQUE - Definition, Totipotency, basic steps in plant tissue culture technique. Nutrient media - basic components, composition of MS & White's media.
Tissue culture techniques and their practical applications. Anther culture, Embryo culture and protoplast culture.
Plant tissue culture industry in India - Scope, products - (Micropropagation of Horticulture plants/plant extracts-) export potential, Indigenous market.

PRACTICAL – IV

GYMNOSPERMS, EMBRYOLOGY OF ANGIOSPERMS, PALYNOLOGY AND TISSUE CULTURE

13 Hrs

- | | |
|---|----------------|
| 1) Study of materials and permanent slides of Gymnosperms included in Theory
units | 5 |
| 2) Permanent slides of microsporogenesis and male gametophyte | 1 unit |
| 3) Mounting of Pollen grains – <i>Grass, Hibiscus, Pollinia of Calotropis</i> and Pollen
Germination (hanging drop method) | .1 unit |
| 4) Permanent slides: Types of ovules, Megasporogenesis & embryosac
Development | 1 unit |
| 5) Permanent slides: Types of placentation — Axile, Marginal, Parietal, basal types.
Sectioning of ovary, for any two types of placentation. | 1 unit |
| 6) Mounting of embryo- <i>Tridax</i> and <i>Cyamopsis</i> . | 1 unit |
| 7) Mounting of endosperm - <i>Cucumis</i> . | 1 unit |
| 8) Mini project work in groups of 3-5 students, from the following list. | 2 units |
-
- Study of pollen morphology of different flowers with respect to shape, colour, Pores etc.
 - Pollen germination of different pollen grains and calculate percentage of germination.
 - Calculating percentage of germination of one particular type of pollen grain collected from different localities/ under different conditions.
 - Study of placentation of different flowers.
 - Tissue culture – Synthetic seeds, Seed culture and stem culture etc.
 - Any other relevant study related to Gymnosperms / Embryology.

Mini project work may be carried out in groups of 3-5 students, supervised by the batch in charge. The mini project report, about 5-6 pages (type written), to be prepared in following format and certified by the teacher in charge and HOD to be submitted in practical examination. 1. Introduction 2. Aim of study 3. Materials & Methodology 4. Observation 5. Conclusion, Copies to be submitted separately by individual members of the group.

PRACTICAL QUESTION PAPER-IV

GYMNOSPERMS, EMBRYOLOGY OF ANGIOSPERMS, PALYNOLOGY AND TISSUE CULTURE

Time: 3 hours.

Max Marks: 35

- | | |
|--|--------|
| 1. Identify and classify specimens A and B giving reasons | 2X3= 6 |
| 2. Identify the slides C, D, E&F with reasons and labelled diagrams | 4X3=12 |
| 3. Mount the embryo/Endosperm of specimen G& comment. | 1X5=5 |
| 4. Mount the pollinia/perform pollen germination of specimen H & comment | 1X4=4 |
| 5. Record & submission | 5+3=8 |

SCHEME OF VALUATION

1. Gymnosperm materials -*Cycas* and *Gnetum* (Identification & classification-1 mark, reasons-2 marks).
2. One Gymnosperm slide, one from T.S. of young anther/ mature anther, one from megasporogenesis/ stages of embryosac development, /placentation (Permanent slides or fresh free hand sections)/ types of ovules included in theory. (Identification – 1 mark, Diagram-1 mark, reasons- 1 mark).
3. Endosperm /Embryo mounting (preparation- 3 marks, comment with diagram-2 marks).
4. Hibiscus pollen/ Pollinia / pollen germination (preparation-2 marks, comment with diagram- 2 marks)
5. Record & submission of mini project report (5 + 3 marks)

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V SEMESTER

PAPER-V: TAXONOMY AND ECONOMIC BOTANY

39 Hrs

UNIT: I CLASSICAL TAXONOMY

13 Hrs

Aim and Scope of taxonomy, Brief History, Broad outline of classification proposed by Bentham & Hooker, Engler&Prantl and their relative merits and demerits. Species concept: Taxonomic hierarchy, species, genus and family.

Biosystematics: Plant nomenclature, Binomial system, ICBN - rules for nomenclature. Taxonomic Tools, Herbarium and its techniques, Floras and their importance, Botanical gardens and their importance (one state level, one national level & one international level). (Examples: State: Lalbagh, National: Indian Botanical garden Sibpur, Calcutta, International: Royal Botanical garden, Kew, England). Chemotaxonomy, Cytotaxonomy, Numerical taxonomy & application of computer.

UNIT: II TAXONOMICAL STUDIES OF FAMILIES 13hrs

Taxonomic studies of following families, according to Bentham & Hooker system of classification and their economic importance.

Dicotyledoneae Families: Polypetalae - Magnoliaceae, Cucurbitaceae, Brassicaceae, Rosaceae and Apiaceae.

Gamopetalae - Asteraceae, Asclepiadiaceae and Lamiaceae.

Monochlamydae - Euphorbiceae

Monocotyledoneae Families: Poaceae (Special reference to importance of Cereals and millets) and orchidaceae.

UNIT: III ECONOMIC BOTANY

13 Hrs

A brief account of pulses.

Study of the following plants with Botanical names, Family, part used, and economic uses.

Edible oils: Groundnut, Coconut and Sesamum; Fibres: Cooton, Jute and Coir;

Beverages: Coffee, tea and cocoa; Timber: Teak and Rosewood; Natural dyes: Indigo;

Spices: Cardamom, clove, cinnamon, saffron and Nutmeg.

Ethnobotany: Ethnopharmacology/Ethnomedicobotany - Definition, Botanicals and application methods of Aloe, Brahmi, Holy basil, Neem, Mint, Turmeric & Nelanelli.

Pomology: Importance of fruits as food and medicine and commercial values - Mango, pomegranate and grape.

Horticulture techniques: Vegetation propagation - Gootee, Grafting and Cutting.

Green house/polyhouse, organic farming, terrace gardening, Hydroponics, Compost and microgreens.

PRACTICAL PAPER – V

TAXONOMY AND ECONOMIC BOTANY

Total Units: 13

1. Morphology of Angiosperms – Vegetative Structure and modifications of root/stem and inflorescence. 1 Unit
2. Morphology of Angiosperms –flower and fruit 1 Unit
3. Methods of identification of plants with Technical terms. 1 Unit
4. Study of taxonomic characters of families included in theory (Minimum one genus from each family) 5 Units
5. Study of economically important plants covered in theory to identify with Botanical names, families, parts used and Economic uses. 2Units
6. Herbarium techniques. 1 Unit
7. Horticulture techniques 2 Units
8. Study of local flora by arranging local collection trips.
9. Record & Submission of 6 Herbaria with field notes of plants included in theory. (It can be reduced to 3/replaced with tour report on Botanical trip/any of the horticulture rechniques carried out).

PRACTICAL QUESTION PAPER- V

TAXONOMY AND ECONOMIC BOTANY

Time: 3 hrs

Max marks: 35

1. Assign the specimens A & B to their respective families giving diagnostic features. $2 \times 3 = 6$
2. Describe C in technical terms; draw the floral diagram with floral formula. $1 \times 6 = 6$
3. Comment on Horticulture technique D $1 \times 3 = 3$
3. Identify the specimen E, F, G, H, I&J with their morphological, Biological & Economic importance. $6 \times 2 = 12$
4. Record and Submission. (Herbaria with field notes) $5 + 3 = 8$

SCHEME OF VALUATION

1. One Polypetalae, one Gamopetalae/Monocot (Identification ½ mark, Classification 1 mark, Diagnostic features 1½ mark)
2. Dicot plant (Technical detail 2 marks, floral diagram 2 marks, floral formula 2 marks)
3. Horticulture technique- Vegetative propagation/hydroponics/mangroves – Comment- 3marks
4. Root/ Stem/ Leaf modification/ Inflorescence/ Fruit and/ Economic Importance (Any two). (Identification ½ mark, diagram ½ mark, description 1 mark, for economic importance, identification with family 1 mark, part use ½ mark economic uses ½ mark)
5. Record- 5 marks.
6. Submission of Six herbaria with field notes of family's studies, ½ marks each-3 marks

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V SEMESTER

PAPER VI: MOLECULAR BIOLOGY, GENETIC ENGINEERING, BIOTECHNOLOGY AND PLANT PHYSIOLOGY

39 hrs

UNIT I MOLECULAR BIOLOGY 13 hrs

Introduction, Discovery, Chemical nature & replication of genetic material, genetic code, non genetic RNA, Biosynthesis of proteins, Regulation of gene action in prokaryotes (Lac operon concept only).

GENETIC ENGINEERING & BIOTECHNOLOGY: Steps in Recombinant DNA technology, Genomic libraries, application of genetic engineering technology in agriculture. A brief account on hazards & safe guards of genetic engineering technology with special reference to Bt Cotton. A brief account of Bioinformatics and its uses.

UNIT II MICROBIAL BIOTECHNOLOGY

13 hrs

Uses of microbes in industry and agriculture fermentation – production of ethanol, production of antibiotics – Penicillin.

PLANT PHYSIOLOGY- I – Water Relations: Importance of water, Diffusion, Osmosis, water potential, Osmotic Potential, Membrane and their Permeability. Absorption Of Water- Mechanisms of water absorptions, factors affecting rate of water absorption.

Stress Physiology: Water stress, heat stress, salt stress and mechanisms of Plant response to water and related stress.

UNIT III PLANT PHYSIOLOGY – II

13 hrs

Mechanism of ascent of Sap – Vital and physical force theories.

Transpiration – Loss of water, Types, Mechanisms, Stomatal Dynamics. Stomatal mechanism, Significance, Factors affecting transpiration, anti - transpirants, Guttation.

Mineral Nutrition In Plants - Major & Minor elements, their deficiency symptoms in plants.

Phloem Transport- Transport of organic solutes. Path of transport, vein loading and unloading. Transcellular or streaming hypothesis, contractive protein hypothesis, mass flow hypothesis, Source – Sink concept.

PRACTICAL PAPER-VI
MOLECULAR BIOLOGY, GENETIC ENGINEERING,
BIOTECHNOLOGY AND PLANT PHYSIOLOGY

Total Units – 13

- | | |
|--|----------------|
| 1. Qualitative Test for Starch, Protein, Reducing Sugars and Lipids. | 2 Units |
| 2. Determination of Osmotic potential of the cell sap by Plasmolytic method. | 1 Unit |
| 3. Determination of Stomatal Index. | 1 Unit |
| 4. Structures of Stomata in Hydrophytes, Mesophytes and Xerophytes. | 2 Units |
| 5. Streaming of Protoplasm to show Cyclosis. | 1 Unit |
| 6. Determination of pH of Plant Samples by using Indicators. | 1 Unit |
| 7. Study of Osmosis & Transpiration Experiments. | 3 Units |
| 8. Study of Phloem Transport by Ringing Experiment. | 2 Units |

PRACTICAL QUESTION PAPER-VI
MOLECULAR BIOLOGY, GENETIC ENGINEERING,
BIOTECHNOLOGY AND PLANT PHYSIOLOGY

Time 3 hours

Max. Marks 35

- | | |
|---|-----------------|
| 1. Conduct the biochemical test of sample A and B. | 3 x 3= 6 |
| 2. Determine the osmotic potential of the cell sap by plasmolytic method / stomatal index of material C | 1X4=4 |
| 3. Determine the pH of the given sample D. | 1X2=2 |
| 4. Set up and comment on the experiment E. | 1X6=6 |
| 5. Comment on experiment F and G. | 4+4 = 8 |
| 6. Record. | 05 |

SCHEME OF VALUATION

1. Samples – Starch, Protein, Reducing Sugar and Lipids (Positive Test - 1 mark, Negative Test – 2 marks).
2. Conducting the Experiment – 3 marks; Principle – 2 marks; Procedure – 1 mark; Result – 2 marks.
3. Extract from Root, Stem, Leaves of a Plant to be given (Determination of pH – 1 mark, Comment – 1 mark).
4. Experiments of E: a. Potato Osmoscope.
b. Thistle Funnel experiment.
c. Farmer's Potometer.
d. GanongsPotometer.