



KARNATAKA STATE AKKAMAHADEVI WOMEN'S UNIVERSITY, VIJAYAPURA

**Syllabus for B.Sc. Optional Botany
(Semester Scheme) with effect from
2018-19 and onwards**

I and II semester syllabus Approved in BoS (UG) Biotechnology dated 14-05-2018
III and IV semester syllabus Approved in BoS (UG) Biotechnology dated 11-06-2019
V and VI semester syllabus Approved in BoS (UG) Biotechnology dated 10-02-2020


Dr. Bheemanagouda N Patil
M.Sc., Ph.D.

**Assistant Professor
HOD of Botany
Smt. A.S.M. College for Women
Ballari-583103.**


IQAC
CO-ORDINATOR
Smt. Allum Sumangamma Member
College For Women, BELLARY.


PRINCIPAL
Smt. ASM College
For Women, BALLARI.



**KARNATAKA STATE AKKAMAHADEVI WOMEN'S
UNIVERSITY, VIJAYAPURA**

New syllabus of B.Sc. Botany Optional Subject, I, II, III, IV, V and VI semesters, w.e.f. 2018-19 and onwards

Subject Code	Subject Title	Teaching Scheme		Examination			
		Hrs/week		Exam. Duration (Hrs)	Marks		
		Theory	Practical		Theory/ Practical	IA	Total
BSc I Semester (w.e.f. 2018-19 and onwards)							
BSBOT 01	Viruses, Bacteria, Cyanobacteria, Algae, Fungi, Lichens And Plant Pathology	4	--	3	60	10	070
	BSBOT 01: PRACTICALS (Based on BSBOT 01)	--	6	3	20	10	030
BSc II Semester (w.e.f. 2018-19 and onwards)							
BSBOT 02	Bryophytes , Pteridophytes , Paleobotany and Gymnosperms.	4	--	3	60	10	070
	BSBOT 02: PRACTICALS (Based on BSMB 02)	--	6	3	20	10	030
BSc III Semester (w.e.f. 2019-20 and onwards)							
BSBOT 03	Morphology, Taxonomy of Angiosperms and Economic Botany	4	--	3	60	10	070
	BSBOT 03: PRACTICALS (Based on BSBOT 03)	--	6	3	20	10	030
BSc IV Semester (w.e.f. 2019-20 and onwards)							
BSBOT 04	Ecology, Environmental Biology, Conservation and Management of plant resources	4	--	3	60	10	070
	BSBOT 04: PRACTICALS (Based on BSBOT 04)	--	6	3	20	10	030
BSc V Semester (w.e.f. 2020-21 and onwards)							
BSBOT 051	Plant Anatomy, Plant Breeding And Propagation And Evolution	4	--	3	80	20	100
BSBOT 052	Cytology, Genetics and Biostatistics	4	--	3	80	20	100
BSBOT 053	BSPR 05: PRACTICALS based on BSBOT 051 and BSBOT 052	--	6	3	80	20	100
BSc VI Semester (w.e.f. 2020-21 and onwards)							
BSBOT 061	Palynology and Biotechnology	4	--	3	80	20	100
BSBOT 062	Plant Physiology and Phytochemistry	4	--	3	80	20	100
BSBOT 063	BSBOT 06: PRACTICALS (Based on BSBOT 061 and BSBOT 062)	--	6	3	80	20	100

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BSc I SEMESTER

BSBT 01	VIRUSES, BACTERIA, CYANOBACTERIA, ALGAE, FUNGI, LICHENS AND PLANT PATHOLOGY
Teaching: 4Hrs/week	Exam. Marks: 60
Total Teaching Hours : 56	IA Marks : 10

UNIT-I: Aim and Scope of Microbiology: 7 Hrs
Viruses: History & Discovery – Characteristics of Viruses, Structure of T.M.V. and Bacteriophage (T-Phase)-Viral disease (papaya leaf curl) (PCLV)

UNIT-II 5 Hrs
Bacteria: Occurrence of Bacteria in air water and soil, Cell structure, Plasmids, Reproduction, Economic importance of Bacteria (Useful and Harmful aspects). Bacterial disease –Citrus canker.

UNIT-III: 6 Hrs
Cyanobacteria : A general account, a occurrence, reproduction, Economic importance, Type study of Gloeotrichia and Scytonema.

UNIT-IV 22 Hrs.
Phycology (Algae): General account, Habitat, Thallus Structure, pigments, pyrenoids, Reproduction and Classification (According to Fristch). Study of structure, reproduction and life cycles of the following. Chlorophyceae: Volvox, Oedogonium and Chara. Xanthophyceae: - Vaucheria. Bacillariophyceae: Diatoms (Pinnate) Phaeophyceae: Sargassum. Economic importance of Algae in general (Algal bloom, diatomaceous earth, Agar-Agar)

UNIT-V 10 Hrs
Mycology (Fungi): General character, classification (According Alexopolus) structure and reproduction of the following. Albugo, Penicillium , Puccinia graminis and Cercospora.

UNIT-VI 5 Hrs
Lichens: Structure, reproduction and economic importance of lichens.

UNIT-VII 5 Hrs
Plant Pathology: Symptoms, casual organisms and control measures of the following diseases.
1) Red rot of sugarcane
2) Wilt of pigeon pea.
3) Grain smut of Sorghum.

References

- 1) A text Book of Botany – Singh, Jain & Pandey.
- 2) Microbiology & Plant pathology – P.D.Sharma
- 3) College Botany for Degree Students – B.P.Pandey.
- 4) Introduction to plant Viruses – C.L.Mandhar.
- 5) Fungi & Lichens – Vasista.
- 6) Text Book of Botany VolI to V. –Ajantha Chadda and S.N.Pandey.

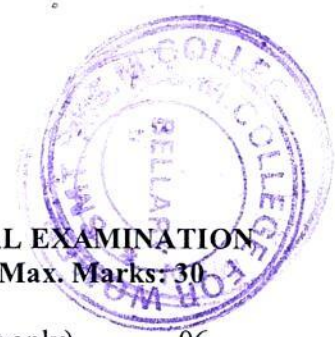


- 7) Mushroom Growity Agro Bios – Jodhpur.
- 8) Bryophyta _ Vashista & others.
- 9) Fungi – S.Chopra
- 10) Algae – Sunder Rajan.
- 11) Botany Vol.II – Gangulee & Kar.

BSBOT 01	Practicals
Practical: 6 Hrs/week	Exam. Marks: 20 IA Marks : 10

- 1) Mounting techniques – Mounting of Algae and Fungi
- 2) Gram staining of bacteria.
- 3) Study of Cyanobacteria –Gloeotrichia & Scytonema.
- 4) Study of Algae – Volvox, Oedogonium & Chara.
- 5) Study of Fungi –Albugo , Penicillium , Puccinia and Cercospora.
- 6) Plant pathology _Viral disease –Leaf curl of papaya, Bacterial disease; Citeres canker,
“Fungal disease - Red rot of sugar cane, wilt of pigeon pea.
- 7) Study of lichens: Foliose & Fructicose.

Note: Every student must submit a project report.



MODEL BOTANY QUESTION PAPER OF B.SC.I SEM. PRATICAL EXAMINATION

Time : 02 Hrs.

Max. Marks: 30

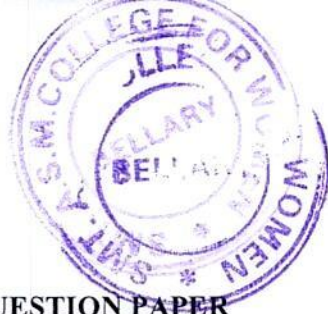
1) Stain and Mount the Speciman 'A' Write the Procedure (flow chart only) & Identify with reasons (Leave the preparation for evaluation)..	06
2) Identify and classify the specimans B, C & D with reasons.	04
3) Identify the disease 'E' mention the casual organism with symptoms.	02
1) Identify the slides specimen F, G, H & I Write the critical notes.	08
2) Record Book.	05
3) Project Report.	05
Total	<u>30</u>

Scheme of Examination :-

- Q.1 A - Gram Staining of Bacteria.
- Q.2 B - Cynobacteria.
- C - Algae
- D - Fungi
- Q.3 E - Plant Viral / Bacterial Disease
- Q.4 F - Cynobacteria slide
- G- Algae Slide
- H- Fungi Slide
- I - Lichen Specimen
- Q.05 Record Book.
- Q.06 Project Report.

Scheme of Evaluation :

Q.1	Preparation	02		
	Procedure (Flow chart)	01		
	Identification With reasons Sketch & label	01		04
Q. 2	Identification -1/2 Classification 1/2 Reason with Sketch & label For each	01	Each 2	06
Q.3	Identification - 1/2 Causal organism Symptoms with Sketch & label	1.1/2		02
Q.4	Identification 1/2 Reasons Sketch & label	1.1/2	Each 02	08
Q.5	Record Book			05
Q.6	Project Report			05
	Total			<u>30</u>



THEORY MODEL QUESTION PAPER

BSBOT01: Viruses, Bacteria, Cyanobacteria, Algae, Fungi, Lichens and Plant Pathology.

Time: 03 Hrs.

Max Marks: 60

Instructions – a) Part –A: All are compulsory

b) Part-B: Solve any five questions from 8 questions

PART-A

Answer the following questions

(1 x 10 = 10)

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

PART – B

Answer any FIVE of the following:

- | | | |
|-----|--|----------|
| Q-1 | | |
| a) | | 6 marks |
| b) | | 4 marks |
| Q-2 | | |
| a) | | 6 marks |
| b) | | 4 marks |
| Q-3 | | |
| a) | | 5 marks |
| b) | | 5 marks |
| Q-4 | | |
| a) | | 5 marks |
| b) | | 5 marks |
| Q-5 | | |
| a) | | 5 marks |
| b) | | 5 marks |
| Q-6 | | |
| a) | | 5 marks |
| b) | | 5 marks |
| Q-7 | | 10 marks |
| Q-8 | | 10 marks |



BSc II SEMESTER

BSBOT 02	Bryophytes , Pteridophytes , Paleobotany and Gymnosperms
Teaching: 4Hrs/week	Exam. Marks: 60
Total Teaching Hours : 56	IA Marks : 10

UNIT-I 15 hrs
Bryophytes : General characters, classification of Bryophytes, Structure and reproduction of Marchantia, Anthoceros and Funaria (Developmental Details are not required) Brief account

UNIT-II 3 Hrs
Economic importance and Evolution of sporophytes in bryophytes.

UNIT-III 14 Hrs
Pteridophytes : General characters, classification of pteridophytes structure and Reproduction of Selaginella, Equisetum & Marselia (Developmental details are not required)

UNIT-IV 4 hrs
(1) Stealar evolution in pteridophytes.
(2) Economic importance of pteridophytes
(3) Heterospory and Seed habit.

UNIT-V 4 Hrs
Paleobotany: Brief account of Geological Time Scale: Types and Process of Fossilization, Impression, Compression, Petrification and Amber.

UNIT-VI 2 Hrs
A brief study of Fossil plants, Rhynia and calamities.

UNIT-VII 18 Hrs
Gymnosperms : (1) General characters, Classification of Gymnosperms.
(2) Structure and reproduction of Cycas, Pinus & Gnetum. (Developmental details are not required)
(3) Economic importance of Gymnosperms.

References

- 1) Text Book of Botany - Singh , Jain & Pandey
- 2) Biology of Bryophytes - Chopra R.N.
- 3) Bryophytes - B.P.Pandey
- 4) College Botany - S.Sunder Rajan.
- 5) Text Book of Botany Vol.2 - Pandey and Ajantha Chada .
- 6) Pteridophytes - B.P.Pandey
- 7) Gymnosperms - G.L.Chopra

8) College Botany

- A.C.Datta



BSBOT 02	Practicals
Practical: 6 Hrs/week	Exam. Marks: 20 IA Marks : 10

- 1) Study of structure and reproductive parts of Marchantia, Anthoceros and Funeria.
- 2) Study of morphological, anatomical and reproductive structures of Selaginella, Equisetum and Marselia.
- 3) Study of fossil slides: Rhynia and Calamities.
- 4) Study of morphological, anatomical & reproductive structures of Cycas, Pinus and Gnetum.
- 5) Project on above plants (Bryophytes, Pteridophytes, Gymnosperms). Mention in the record Book.





MODEL BOTANY QUESTION PAPER OF B.SC.II SEM. PRACTICAL EXAMINATION.

Time : 03 Hrs.

Max: Marks : 30

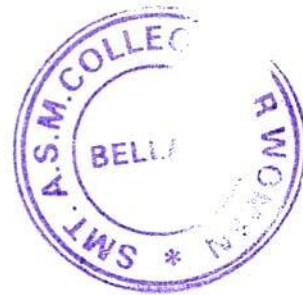
Q.1) Identify, classify the specimens A,B & C with reasons.	06
Q.2) Describe the anatomy of specimens D and E	06
Q.3) Identify and write the reasons of F, G H and I	08
Q.4) Record Book	<u>05</u>
Q.5) Project Report	<u>05</u>
Total	<u>30</u>

Scheme of Examination:

Q.1	A.- Bryophyte
	B- Pteridophyte
	C- Gymnosperm
Q.2	E- Pteridophyte/Gymnosperms.
Q.3	F. Bryophyte
	G- Pteridophyte
	H- Gymnosperm
	I- Fossil slide.
Q.4	Record Book
Q.5	Project Report

Scheme of Evaluation:

Q.1	Identification ½		
	Classification ½		
	Reasons, Sketch and Labell	1	
			Each 2
			06
Q. 2	Sketch and labell	2	
	Characters	2	
			04
Q. 3	Identification	1	
	Reasons with Sketch & labell	1	
			Each 2
			08
Q.4	Record Book		<u>05</u>
Q.5	Project Report		<u>05</u>
			Total
			<u>30</u>



THEORY MODEL QUESTION PAPER

BSBOT 02: Bryophytes, Pteridophytes, Paleobotany and Gymnosperms.

Time: 03 Hrs.

Max Marks: 60

Instructions –a) Part –A: All are compulsory

b) Part-B: Solve any five questions from 8 questions

PART-A

Answer the following questions

(1 x 10 = 10)

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

PART – B

Answer any FIVE of the following:

- | | |
|-----|----------|
| Q-1 | |
| a) | 6 marks |
| b) | 4 marks |
| Q-2 | |
| a) | 6 marks |
| b) | 4 marks |
| Q-3 | |
| a) | 5 marks |
| b) | 5 marks |
| Q-4 | |
| a) | 5 marks |
| b) | 5 marks |
| Q-5 | |
| a) | 5 marks |
| b) | 5 marks |
| Q-6 | |
| a) | 5 marks |
| b) | 5 marks |
| Q-7 | 10 marks |
| Q-8 | 10 marks |



BSc III SEMESTER

BSBOT 03	Morphology, Taxonomy of Angiosperms and Economic Botany	
Teaching: 4Hrs/week	Total Teaching Hours : 56	Exam. Marks: 60 IA Marks : 10

Morphology:

Root: – Characters, functions & Types of Root system. Modification for storage, support & vital functions (Respiratory, Photosynthetic, Haustorial Epiphytic) 05 Hrs

Stem:- Characters, functions & Types. Underground, sub-aerial & aerial modification 05 Hrs

Leaf: Structure & Functions, Phyllotaxy, venation types of Compound leaves. Modifications of Leaf & Stipules. Insectivorous plants (Sundew, Pitcher & Bladderwort) 06 Hrs

Inflorescence: Types of Inflorescence – Racemose , Cymose and Special types. (Cyathium, Hypanthodium & Verticillaster) 04 Hrs

Flower: Bract, Calyx, variations, Corolla variations & Aestivation, Androecium Placentation: Types. Types of flowers based on Insertion of floral whorls on the thalamus 06 Hrs

Fruit: Classification & Types – Simple aggregate & composite. 04 Hrs

Taxonomy of Angiosperms: - 1) Botanical nomenclature, (ICBN principals Herbarium techniques) Botanical Gardens, Botanical Survey of India its functions. Important Herbaria.
2) Classification systems by Bentham & Hooker, Engler & Prantal Salient features, Merits & demerits 04 Hrs

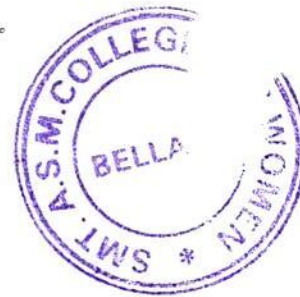
Study of following families with economic importance (Bentham& Hooker system to be follows).

Dicotyledons: Brassicaceae, Malvaceae, Rutaceae, Papilioaceae, Caesilpinae, Mimosidae, Myrtaceae, Cucurbitaceae, Rubiaceae, Asteraceae, Apocyanaceae, Ascelepiadaceae, Solanaceae, Verbinaceae, Lamiaceae , Amaranthaceae & Euphorbiaceae. 17 Hrs

Monocotyledons : Liliaceae, Arecaceae & Poaceae, 04 Hrs

Economic Botany: (Botanical name, Family, Part used & Uses)

- 1) **Cereals & Millets:-** Jower, Ragi, Wheat, & Rice.
- 2) **Pulses:** Black gram, Bengal gram & Red gram.
- 3) **Fats:** Ground nut, Coconut & Safflower.



- 4) **Beverages:** Tea & Coffee.
5) **Fibers:** Cotton, Coir & Deccan Hemp.
6) **Spices:** Cardamom & Clove.
7) **Timber:** Teak & Rose wood.
8) **Narcotic:** Tobacco. Ganja & Opium
9) **Medicinal plants:** Rawolfia, Withania, Vinca, Mentha, Aloe & Ocimum.

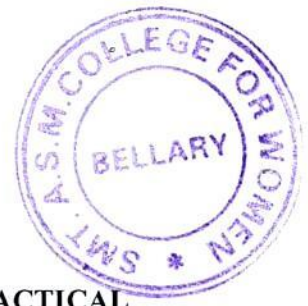
05 Hrs

References

- 1) College Botany - A.C.Datta.
2) College Botany Vol.I - Gangulee, Das & Datta.
3) Economic Botany - B.P.Pandey.
4) Taxonomy of Angiosperms - Singh & Jain.
5) Plant Taxonomy - Sunder Rajan.
6) Plant Taxonomy - Saxena&Saxena.
7) Plant Taxonomy - Vasishta
8) Plant Taxonomy - B.P.Pandey
9) Economic Botany - Bendre& Kumar
10) Plant Taxonomy - G.P.Sharma.

BSBOT 03	Practicals
Practical: 6 Hrs/week	Exam. Marks: 20 IA Marks : 10

- 1) **Angiosperm Morphology:** Specimens of morphological interest based on theory. (Root, Stem & Leaves: modifications, phyllotaxy, compound leaves, Types of inflorescence & fruits.
- 2) **Dicot families:** Brassicaceae, Malvaceae, Rutaceae, Ceasalpiniaceae, Mimosae, Papilionaceae, Cucurbitaceae, Rubiaceae, Asteraceae, Apocynaceae, Ascelpiadaceae, Solanaceae, Amaranthaceae & Euphorbiaceae.
Monocot families : Liliaceae, Arecaceae & Poaceae.
- 3) **Floral formula & floral diagram:** Hibiscus, Ixora, Vinca & Calotropis.
- 4) **Economic Botany:** Study of Economic important products based on theory.
- 5) Visit to nearby forests / Botanical Gardens to study natural Habitat.
- 6) Submission of minimum of 05 herbarium/ photographs.



MODEL BOTANY QUESTION PAPER OF B.SC.III SEM. PRACTICAL

EXAMINATION.

Time: 03Hrs.

Max. Marks : 20

Q.1 Identify, classify the specimens A, B, C & D with reasons:	08
Q.2 Draw floral diagram & write floral formula of specimen E.	02
Q.3 Identify & Describe morphological peculiarities of specimen F, G & H.	06
Q.4 Identify & Mention the economic importance of specimens J.	02
Q.5 Record Book	02

	20

SCHEME OF EXAMINATION

- Q.1 A.-Polypetalae.
 B- Gamopetalae.
 C- Apetale
 D- Monocot
- Q.2 Floral diagram & formula of Specimen E.
- Q.3 F) - Root/Stem
 G) Leaf /Inflorescence.
 H) Fruit.
- Q.4 Economic importance of specimens I.
- Q.5 Record Book

SCHEME OF EVALUATION :

Q.1	Identification	½	each -02	08
	Classification	½		
	Reasons	01		
Q 2	Floral diagram	01		
	Floral formula			02
	Identification	01		
Q.3.	Identification	01	each-02	
	Morphological Peculiarities	01		06
	Sketch & label			
Q.4.	Identification	01	-02	
	Economic Importance With Common, Botanical name	01		02
	Sketch & label			
Q.5.	Record Book			02
				<u>20</u>



Theory Model Question Paper

**BSBOT 03: Morphology, Taxonomy of Angiosperms and
Economic Botany**

Time: 03 Hrs.

Max. Marks: 60

Instructions:

- 1) Questions of PART-I are compulsory.
- 2) Answer any FIVE Questions from PART-II
- 3) Labeled diagrams will enhance the value of answer.

PART-I

Q.1 Answer the following:

(1 x 10=10)

- 1)
- 2)
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)
- 10)

PART-II

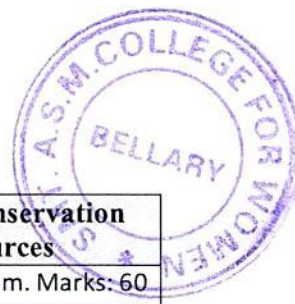
Q.II Answer any FIVE of the Following:

(10 x 5 = 50)

- 1) a)
- b)
- 2) a)
- b)
- 3) a)
- b)
- 4) a)
- b)
- 5) a)
- b)
- 6) a)
- b)
- 7)
- 8)

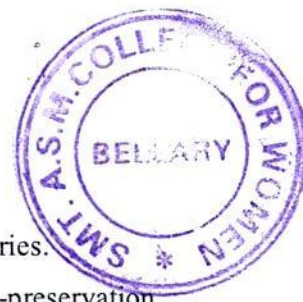
- 06
- 04
- 06
- 04
- 05
- 05
- 05
- 05
- 05
- 05
- 10
- 10

BSc IV SEMESTER



BSBOT 04	Ecology, Environmental Biology, Conservation and Management of plant resources
Teaching: 4Hrs/week	Exam. Marks: 60
Total Teaching Hours : 56	IA Marks : 10

- 1) Concepts and components of Ecosystem: – Types of Ecosystem, Trophic organization, Ecological pyramids. **06 Hrs**
 - 2) Energy flow methods :- (Food chain & Food web) **02 Hrs.**
 - 3) Gynecology:- E-cads & Ecotypes. **02 Hrs.**
 - 4) Plant succession:–Xerosere, Hydrosere & Climax concept **03 Hrs.**
 - 5) Ecological Adaptations: –Hydrophytes, Xerophytes, Halophytes, Epiphytes, Parasitic, angiosperms (Biology) **05 Hrs.**
 - 6) Pollution:- Air, water & Soil pollution – Its definition, pollutants effects on organisms and control measures. **05 Hrs**
 - 7) Noise pollution: –Definition, effect and control measures. **01 Hrs**
 - 8) Radioactive pollution: –Definition, effect & control measures. **01 Hrs.**
 - 9) Ozone depletion, Global warming, Acid rain and nuclear winter (Definition, causes & control measure) **03 Hrs.**
 - 10) Activities of NEERI, IUCN, WWF, CPCB & BNHS. **03 Hrs.**
 - 11) Remote sensing and its applications. **01 Hrs.**
 - 12) Biological diversity – Genetic and species diversity. Endangered species, Hot spots, Natural forests and their importance in biodiversity & Red Data Book. **06 Hrs.**
 - 13) Energy Resources: - Renewable and non-Renewable Energy resources **02 Hrs.**
 - 14) Phytogeography: - Major plant communities
 - a) Aquatic – Fresh Water , Marine and Eusturion communities
 - b) Terrestrial – Grassland, Desert & Forest.
- Forest Communities: - Tropical rain forest – Tropical deciduous and coniferous forest –Floristic regions of India (Botanical) Vegetation of Kamataka. **10 Hrs.**
- 13 Plant Genetic resource Management:- Conservation of Genetic Resource of Economic plants.



In-Situ:- Biosphere reservoirs, National parks, Wild life sanctuaries.

Ex-Situ: - Field Gene banks, Seed banks. Tissue culture & Cryo-preservation.

Brief Study of National & International organizations concerned with explanation, collection and conservation such as BSI (Botanical Survey of India) NBPGR (National Bureau of Plant genetic resources) CGAIR (Consultative Group for Indian agriculture research.)

10 Hrs.

References

- 1) Plant ecology and Soil science - Shukla & Chandel.
- 2) Environmental Science - S.S.Purohit
- 3) Ecology & Environment - P.D.Sharma
- 4) Ecology , Environment & Pollution - S.S.Purohit
- 5) Plant Ecology - Amnbast R.S.
- 6) Plant Ecology - Kocher P.L.
- 7) Plant Genetic Resources - Rana R.S.
- 8) A. Text Book of Plant Ecology. - Bharucha F.R.
- 9) Pollution & Biomonitoring. - Rana B.C.
- 10) Plant Propagation, Principles & Practices - Hartman H.T.

BSBOT 04	Practicals
Practical: 6 Hrs/week	Exam. Marks: 20 IA Marks : 10

- 1) Study of Ecological adaptation :- (Morphological& Anatomical)
Hydrophytes, Xerophytes, Halophytes & Epiphytes.
- 2) Ecological Instruments :-
Anemometer, Rain guage, Hygrometer (Wet & Dry bulb Thermometer) Max-Min Thermometer.
- 3) A Project of botany related subject.
- 4) Trip to nearby forest to study vegetation.
- 5) Visit to a pond to study communities / Visit to meteorological station and submit a report.



**MODEL BOTANY QUESTION PAPER OF B.SC. IV SEM. PRACTICAL
EXAMINATION.**

Time: 03 Hrs.

Max. Marks: 20

Q.1 Identify & assign the plant 'A' to its respective ecological group. Explain Morphological Adaptations with labeled diagrams.	05
Q.2 Identify & assign the plant 'B' to its respective ecological group. Explain Anatomical Adaptations with labeled diagrams.	05
Q.3. Identify & comment on the given slides / Specimen / Instrument, C, D, E & F	08
Q.3 Record Book	02
Total	20

Scheme of Examination :-

- Q.1 Ecology (Adaptations) Entire plant / Twig (Morphology & Anatomy) any one Plant Belongs to Hydrophytes, Xerophytes, Halophytes & Epiphytes.
- Q.2 Identification Reasons with diagram. B-Ecological Slide, C-Ecological instrument D-Ecological plant, E –Ecological Slide.
- Q.3 Record Book

Scheme of Evaluation :-

Q.1 Identification -01 Morphological & Anatomical Peculiarities 04 & Sketch	10
Q.2 Identification – 01 each -02 Sketch with reasons 02	08
Q.3 Record Book With Report	<u>02</u>
	<u>20</u>



Theory Model Question Paper

BSBOT 04: Ecology, Environmental Biology, Conservation and Management of Plant Resources.

Time: 03 Hrs.

Max. Marks: 60

Instruction:

- 1) Questions of PART-I are Compulsory.
- 2) Answer any FIVE Questions from PART -II
- 3) Labeled diagrams will enhance the value of Answer.

PART-I

Q.1 Answer the following:

(1 x 10=10)

- 1)
- 2)
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)
- 10)

PART-II

Q.II Answer any FIVE of the Following:

(10 x 5 = 50)

- 1) a)
- b)
- 2) a)
- b)
- 3) a)
- b)
- 4) a)
- b)
- 5) a)
- b)
- 6) a)
- b)
- 7)
- 8)

- 06
- 04
- 06
- 04
- 05
- 05
- 05
- 05
- 05
- 05
- 05
- 10
- 10

BSc V SEMESTER



BSBOT 051	Plant Anatomy, Plant Breeding And Propagation And Evolution	
Teaching: 4Hrs/week	Total Teaching Hours : 60	Exam. Marks: 80 IA Marks : 20

PLANT ANATOMY:

1. **Meristems:** General account, Classification of meristems based on—Origin, function, position and development. **3hrs**
2. **Tissues:** General account of Permanent tissues and tissue systems: Epidermal tissue system, Ground tissue system, Vascular tissue system and Secretory tissue system – structure of xylem and phloem. **6hrs**
3. Anatomy of Dicot stem, root and leaf (ex: Bengal gram). **3hrs**
4. Anatomy of Monocot stem, root and leaf (ex: Grass). **3hrs**
5. Normal secondary growth in Dicot stem and root. A brief account of cambium (origin, types and function). Origin and development of lateral roots. **6hrs**
6. A brief account of anomalous secondary growth in stem – Study of anomalous secondary growth in Bougainvillia , Boerhaavia and Dracena (stem). **4hrs**

Plant Breeding:

12hrs

1. Introduction and objectives.
2. Methods in plant breeding;
 - a) Mass selection
 - b) Pure line selection
 - c) Clonal selection
3. Hybridization and somatic hybridization.
Heterosis and its significance.

Plant Propagation and Nursery Management:

20 hrs

1. Tools and materials used in propagation, importance of green house
2. Plant propagation: – Methods of propagation – through seeds, cuttings, roots, corm, bulb, rhizome and leaf. Cuttings, layering, budding grafting.



3. Nursery – definition, importance of nursery management, site selection, planning, budgeting, layout of nursery, preparation of nursery beds, raising of seedlings, transplanting techniques.
4. Green House: Types and significance

Evolution:

Brief account of theories of evolution- Darwinism, Lamarckism and mutation theory.

References:

1. M.S. Tayal, plant anatomy, Rastogi publications, Meerut.
2. Singh, Pandey and Jain, A textbook of Botany (Angiosperm anatomy, Economic).
3. B.P. Pandey, Embryology of Angiosperm, Rastogi publication, Meerut.
4. B.P. Pandey, Plant anatomy, S. Chand and Co. Ltd, Ram nagar, New Delhi.
5. Embryology of Angiosperm Bhajwani and Bhatnagar, 1998 Vikas publication, New Delhi.
6. Pandey SN and Ajanta Chaddha Plant anatomy and Embryology, Vikas publication, New Delhi.
7. P.C. Vasista, Plant anatomy, S.Chand publishing house, New Delhi.
8. Singh, B.D. (2005). Plant Breeding: Principles and Methods. Kalyani Publishers. 7th edition.
9. Chaudhari, H.K. (1984). Elementary Principles of Plant Breeding. Oxford – IBH. 2nd edition.
10. Acquaah, G. (2007). Principles of Plant Genetics & Breeding. Blackwell Publishing.

BSBOT 052	Cytology, Genetics and Biostatistics	
Teaching: 4Hrs/week	Exam. Marks: 80	
Total Teaching Hours : 60	IA Marks : 20	

Cytology:

1. Introduction to cytology. **1hr**
2. Study of ultra structure of plant cell and organelles :- cell membrane, endoplasmic reticulum **5hrs**
3. Nucleus – structure and function. **2hrs**
4. Chromosomes – types, structure and functions, ultra structure of chromosomes with special reference to the nucleosome. Giant Chromosomes: – salivary gland and lamp brush chromosomes. **4hrs**
5. Chromosomal aberrations: Deletion, duplication, translocation and inversion **4hrs**
6. Numerical variation - Euploidy and Aneuploidy and its significances **4hrs**



Genetics:

1. Introduction, Mendel and his experiments on Pea. Mendel's laws of inheritance, test cross, dihybrid test cross, back cross (with related problems). **4hrs**
2. Modification of Mendelian ratio. **6hrs**
 - a. Gene interaction – supplementary, duplicate, complementary Genes, Epistasis (Dominant and recessive) – with suitable plant examples.
 - b. Polygenic inheritance – Ear size in maize.
 - c. Multiple alleles – Blood groups
3. Sex determination: **3hrs**
 - a. Chromosome theory of sex determination –Heterogametic, Haplo-diploidy, and genic balance theory, XX – XY. Human beings and Mellandrium.
 - b. Sex linked inheritance – Color blindness in human beings, hypertrichosis.
4. Linkage and crossing over mechanism in maize and mechanism of crossing over (coupling and repulsion) **2hrs**
5. Cytoplasmic inheritance with reference to *Mirabilis jalapa* **2hrs**
6. Gene: Concept of gene, Gene expression and regulation (exons, introns, inducible, repressible genes), Lac-operon concept. **4hrs**
7. Mutation: types (Spontaneous, induced and point mutation), mutagens **2hrs**
8. Nucleic acids: **6hrs**
 - a. Structure, chemical composition and function of DNA and RNA. **3hrs**
 - b. DNA replication, semi conservative method **1hr**
9. Genetic Code – meaning and properties and protein synthesis. **3hrs**

Biostatistics (Biometry):

1. Mean, mode and median (meaning and definition) **1hr**
2. Measures of variation, standard deviation, standard error and correlation, regression (only meaning and definition). **1hr**

References:

1. Genetics – P. K. Gupta, Rastogi Publications, Meerut.
2. College Botany Vol 04 – S. Sundarajan, Himalaya Publishing House, Mumbai.
3. Cytogenetics – P. K. Gupta, Rastogi Publications, Meerut.
4. Cytology, genetics and evolution – P. K. Gupta, Rastogi Publications, Meerut.
5. Cell Biology – Singh and Tomeir, Rastogi Publications, Meerut.
6. A Text book of Cell and Molecular Biology – P. K. Gupta, Rastogi Publications, Meerut.
7. Elements of Biostatistics – Sadguru Prasad , Rastogi Publications, Meerut.
8. Nursery Management – Kulkarni
9. Indoor Gardening – G. V. Publication House, 322, Raibhadur Bazar, Jodhpur



BSPR 053	Practicals based on BSBOT 051 and BSBOT 052 *
Practical: 6 Hrs/week	Exam. Marks: 80 IA Marks : 20

Section A:

I. Plant Anatomy:

- 1) Study of root apex and shoot apex (Permanent slides only) Study of tissues, Parenchyma, Collenchyma, Sclerenchyma, Xylem and Phloem (Permanent slides only)
- 2) Maceration of tissues and the observation of sclereids- types, vessel- thickenings (10% Chromic acid, 10% Sulphuric acid).
- 3) Study of Stomata and Epidermal hair of (a) Sunflower / Tridax, (b) Tomato/ Vinca/Solanum, (c) Spinach (d) Tradescantia /Rheo (e) Cucurbits (f) any locally available plant.
- 4) Anatomy of young Dicot Stem (TS) – Tridax/ Bengal gram/ Cucurbits.
- 5) Anatomy of young Dicot root (TS) – Bengal gram
- 6) Anatomy of young Monocot stems (TS) Grass/ Sorghum/ Bamboo.
- 7) Anatomy of young Monocot root (TS) Grass/ Sorghum/ Bamboo.
- 8) Anatomy of young Dicot leaf (TS) Sunflower
- 9) Anatomy of young Monocot leaf (TS) Grass/ Sorghum/ Bamboo.
- 10) Anatomy of stem Boerhaavia (TS) – Sectioning.
- 11) Anatomy of Bougainvillea stem (TS) sectioning.
- 12) Anatomy of Dracena Stem (TS) Sectioning.

II. Plant breeding:

1. Practice of hybridization techniques in a self pollinated and cross pollinated plants (any available plant).
2. A visit to agricultural research centre for observation and record of inter variety and inter species

III. Plant Propagation

1. Methods of plant propagation
 - a) Budding
 - b) Grafting
 - c) Gooting
 - d) Layering
 - e) Cutting

Section B:

I. Cytology:

1. Study of cell division – Mitosis in onion root tips (Squash method).
2. Study of cell division – Meiosis in Rheo discolour or Allium Ceba or any available material/flower buds (Smear method).
3. Cytological technique of making (Mitosis and Meiosis) permanent slides.
4. Observation of polytene and lamp brush chromosomes (Permanent slides).



5. To conduct the micro chemical tests (cellulose, lignin, starch, protein, cutin, cystolith, raphides/sphero raphides) procedures.

II. Genetics:

1. Genetics problems based on theory syllabus – monohybrid, dihybrid, test cross and interaction of factors.





MODEL QUESTION PAPER B.Sc- V Sem (BSBOT 053)

PRACTICAL EXAMINATION

Time : 4 Hrs

Max. Marks : 80

- Q1. Prepare a temporary double stain TS of material "A" and identify with reasons (leave the observation for examiner) 10 Marks
- Q2 Macerate / mount the specimen "B" , identify any two elements with labelled sketch and give reasons./ type of stomata 05 Marks
- Q3 Demonstrate the technique of hybridization specimen "C" Emasculation and Bagging. 05 Marks
- Q4 Prepare a plant propagation "D" by cutting / Layering /Budding and explain its advantages 05 Marks
- Q5 Identify & describe the Anatomy slide "E" & "F" 08 Marks
- Q6 Make a squash / Smear preparation of specimen "G" . Identify any two stages , sketch and label and show the preparation to the examiner 10 Marks
- Q7 Conduct Micro chemical test of specimen 'H' . Identify , sketch and label and show the preparation to the examiner 05 Marks
- Q8 Solve the genetic problem 'I'. 05 Marks
- Q9 Identify the Cytology slides 'J', 'K' & 'L' 12 Marks
- Q 10 Certified Journal 10 Marks
- Q11 Project report 05 Marks



BSc VI SEMESTER

BSBOT 061	Palynology and Biotechnology	
Teaching: 4Hrs/week		Exam. Marks: 80
Total Teaching Hours : 60		IA Marks : 20

PLANT EMBRYOLOGY AND PALYNOLOGY

- 1 **Introduction:** Plant embryology a general account
- 2 **Indian embryologists:** P. Maheshwari, B.G.L. Swamy and B. M. Johri
- 3 **Anther development** –Microsporogenesis, Male gametophyte.
- 4 Types and role of tapetum, ubisch bodies, pollen kit, concept of male germ unit (MGU)
- 5 **Ovule development:** Megasporogenesis, Female gametophyte–Structure of mature
- 6 embryosac (Polygonum). Endothelium, Epistase, Hypostase.
- 7 **Types of embryosacs:** Monosporic (Polygonium), Bisporic (Allium) and Tetrasporic (Adaxa), concept of female germ unit (FGU)
- 8 **Types of Ovule :** Orthotropous, Anatropous, Hemianatropous, Amphitropous, Camphylostropous and Circinotropous.
- 9 **Pollination:** Self and cross Pollination, general account and Contrivances for self and cross pollination. Significance of self and cross pollination
- 10 **Fertilization :** Double fertilization and triple fusion, its significance
- 11 **Endosperm:** Development and types, Free nuclear, cellular and Helobial . A brief account of perisperm
- 12 Structure and development of dicot embryo (Cruciferae) monocot embryo (Grass)
- 13 A brief account of Polyembryony, Apomixis and Parthenocarpy.
- 14 **Palynology:** Definition and scope. Pollen morphology (size, shape, structure,
- 15 Aperature, symmetry and significance

BIOTECHNOLOGY:

- | | |
|--|---------|
| 16 Introduction and scope of Biotechnology and its applications. | 06 hrs. |
| 17 13. Genetic engineering; r-DNA technology and its applications. | 03 hrs. |
| 18 14. DNA finger printing and its applications. | 03 hrs. |
| 19 15 Transgenic plants: BT-Cotton and Golden rice | 02 hrs. |
| 20 16. Plant tissue culture and its applications. | 04 hrs |



BSBOT 062	Plant Physiology and Phyto chemistry
Teaching: 4Hrs/week	Exam. Marks: 80
Total Teaching Hours : 60	IA Marks : 20

Plant Physiology

- 1 Introduction to plant physiology
- 2 Water sources, types and importance to plant life.
- 3 Physical process of water absorption - Imbibition, Diffusion, Osmosis, Plasmolysis water potential, D.P.D., Osmotic potential, Pressure potential, T.P. and W.P.
- 4 Absorption of water – Absorbing regions (region of root)
Mechanism of absorption – active absorption (osmotic and non-osmotic)
Passive absorption (symplast and apoplast). Factors affecting water absorption
- 5 Ascent of Sap – meaning, mechanism and theories.
Vital theory, rhythmic theory, pulsatory and root pressure theory.
- 6 Physical theories – capillary force, imbibitional, atmospheric pressure, transpiration pull and cohesive force theory
Transpiration – definition, types, structure of stomatal apparatus.
- 7 Mechanism of opening and closing of stomata.
Theories – Photosynthesis theory, Starch and sugar inter conversion theory, active proton or K^+ , transport concept.
Factors affecting the process of transpiration (external and internal)
Significance of transpiration.
Guttation – definition and structure of Hydathode
- 8 Mineral absorption – passive absorption, ion exchange, Donnan's equilibrium.
Active absorption – carrier concept, Landgrath's theory, Protien Leacithin theory
- 9 Enzymes – Nomenclature, Characteristics, classification and mode of action.
Translocation of organic solutes – Cytoplasmic streaming and Munch's mass flow hypothesis
- 10 Photosynthesis – Introduction, significance, structure and function of chloroplast
Quantosomes, Pigment System, Solar spectrum and its importance. Mechanism of photosynthesis – Light reaction, cyclic and non-cyclic photo phosphorylation
Dark reaction – C_2 C_3 and C_4 cycle.
Factors affecting the photosynthesis
- 11 Respiration – Introduction, definition, types of respiration (aerobic and anaerobic). 6 hrs
Mechanism of glycolysis, Kreb's cycle and terminal oxidation.
Anaerobic – Alcoholic and acidic fermentation.
Factors affecting respiration (internal and external). RQ
12. Growth hormones – Auxins, Gibberellins, Cytokinins, ABA and Ethylene – their role in growth and applications (experimental study not necessary).
13. **Seed dormancy:** General account, factors regulating
Physiology of senescence: General account, role of plant growth regulators in senescence



Plant Movements: Tropic and nastic movements, Geotropism, Thigmotropism, Phototropism, hydrotropism, Seismonasty, Thigmonasty

14. Physiology of flowering: Photoperiodism and Vernalization, devernalization, florigen concept. 2 hrs
15. Nitrogen metabolism: Sources of nitrogen, nitrogen cycle and its importance. Mechanism of biological nitrogen fixation

References:

- 1 Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot, Allahabad.
- 2 Bhojwani, S.S. & Bhatnagar, S.P. (2011). Embryology of Angiosperms. Vikas Publication House Pvt. Ltd. New Delhi. 5th edition.
- 3 Bhojwani, S.S. and Razdan, M.K., (1996). Plant Tissue Culture: Theory and Practice. Elsevier Science Amsterdam. The Netherlands.
- 4 Glick, B.R., Pasternak, J.J. (2003). Molecular Biotechnology- Principles and Applications of recombinant DNA. ASM Press, Washington.
- 5 Dubey, R.C., 2005 A Text book of Biotechnology S.Chand & Co, New Delhi.
- 7 Kumaresan, V. 2005, Biotechnology, Saras Publications, New Delhi.
- 8 John Jothi Prakash, E. 2004. Outlines of Plant Biotechnology. Emkay Publication, New Delhi.

BSPR 063	Practicals based on BSBOT 061 and BSBOT 022
Practical: 6 Hrs/week	Exam. Marks: 80 IA Marks : 20

Section A:

EMBRYOLOGY:

1. Study of anther and ovule – microsporogenesis and megasporogenesis (Permanent slides of different stages)
2. Mounting of pollen grains (available flowers only) Ipomea, Vinca, Malvaceae and Legume.
3. Study of Ovule – Megasporogenesis and Female gametophyte (permanent slides of different stages)



4. Placentation types mounting and Permanent slides.
5. Mounting of endosperm – Cucumis/ Croton/ Radish/Tridax.
6. Mounting of Embryo croton/ Tridax/ Cucumis/ Cotalaia/ Cluster beans/ Chilli.
7. Study of embryo development by observing Globular, heart shaped and mature dicot embryo (permanent slides).
8. M.S Media preparation procedure and inoculation techniques.

Section B:

Physiology Experiments:

1. Diffusion – Diffusion of solid into liquid (minor)
2. Osmosis – Physical and physiological – Endosmosis and Exosmosis (minor).
3. Plasmolysis and Deplasmolysis – In cells of Rheo discolour leaf.
4. Imbibition – Imbibition process (minor) – Imbibition pressure(Dilatometer)
5. Absorption of water – To show passive absorption by showing relationship between absorption and transpiration.(Trans absorbometer)
6. Ascent of Sap:
 - a) To show ascent of Sap by Balsam plant and in a fresh plant twig (minor).
 - b) To show root pressure.
 - c) To show suction due to transpiration.
7. Translocation of solutes:
 - a. Girdle Experiment – Phloem as food translocation tissue.
 - b. Girdle Experiment –Xylem as conducting tissue.
8. Transpiration:
 - a) Experiment to show transpiration by bell jar (minor).
 - b) Ganong's and Former's Photometer
 - c) Four leaf and cobalt chloride paper method.
 - d) Guttation to be observed (minor).
9. Photosynthesis:
 - a) Evolution of oxygen (minor).
 - b) Effect of quality of light on photosynthesis.
 - c) Effect of CO₂ concentration on photosynthesis.
 - d) Light is essential for photosynthesis (minor).



- e) CO_2 is essential for photosynthesis.
- f) Chlorophyll separation by paper chromatography method.
- g) Chlorophyll is necessary for photosynthesis (minor). (with starch test)

10. Respiration:

- a) Aerobic respiration – Ganong’s Respiroscope and lime water method.
- b) Anaerobic respiration.
- c) Alcoholic fermentation – Kunhe’s tube (minor)
- d) Measurement of R.Q.
- e) Evolution of heat during respiration (minor)

11. Growth: Arc Auxonometer(minor)

12. Plant growth movements:

- a) Phototropism(minor)
- b) Clinostat (minor)
- c) Hydrotropism(minor)
- d) Thigmotropism (minor)


Note: Students should visit nearby tissue culture laboratory.

Dr. Rameshwaraj H. Pillai
M.Sc., Ph.D.
Assistant Professor
HOD of Botany
Smt. A.S.M. College for Women
Bellary-581103.



MODEL BOTANY QUESTION PAPER – BSBOT063
B.Sc.- VI SEMESTER PRACTICAL (Embryology and Plant Physiology)
Time: 4 Hrs **Marks: 80**

- Q1 . Setup Physiology Experiment “A” . Write the procedure & conclusion with diagram.
Show to the examiner (major) 09 Marks
- Q2. Setup physiology experiment “B” . Write the diagram, observation and conclusion.
Show to the examiner (minor) 06 Marks
- Q3. Write the Procedure of the inoculation technique/ write MS media preparation procedure. 05 Marks
- Q4. Identify and comment on the physiological.Experiment “D”, “E”, “F”, “G” & “H”. 15 Marks
- Q5. Mount the Endosperm “I” sketch & label the parts, (Leave the preparation for observation) 09 Marks
- Q6. Mount the embryo “J” sketch & label the parts. (Leave the preparation for observation). 05 Marks
- Q7. Mount / Take T.S. of given material “K” Pollen grain/ Pollinium/ Placentaion .
Sketch & label the parts (Leave the preparation for observation). 06 Marks
- Q8.. Identify & describe the embryology slides “L” & “M” with reasons. 10 marks
- Q9. Certified Journal 10 Marks
- Q10 Project Submission 05 Marks


Dr. Bheemanagouda N Patil
M.Sc.,Ph.D.
Assistant Professor
HOD of Botany
Smt. A.S.M. College for Women
Ballari-583103.


IQAC
CO-ORDINATOR
Smt. Allum Sumangalamma Memorial
College For Women, BELLARY.


PRINCIPAL
Smt. ASM College
For Women, BALLARI.



ಕರ್ನಾಟಕ ರಾಜ್ಯ ಅಕ್ಕಮಹಾದೇವಿ ಮಹಿಳಾ ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ವಿಜಯಪುರ
(ಹಿಂದಿನ ಪದನಾಮ "ಕರ್ನಾಟಕ ರಾಜ್ಯ ಮಹಿಳಾ ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ವಿಜಯಪುರ")

Karnataka state Akkamahadevi Women's University, Vijayapura

(Formerly known as "Karnataka State Women's University, Vijayapura")

DEPARTMENT OF BOTANY

Scheme of Teaching and Examinations and Syllabus of
B.Sc. (Hons) Botany for III and IV Semester

As per NATIONAL EDUCATION POLICY 2020 regulations
w.e.f. 2022-23 and onwards

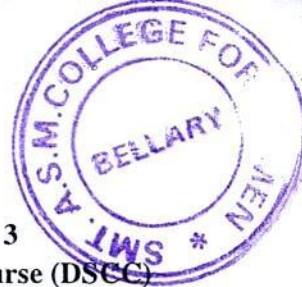
Approved in BoS In Botany (UG) dated 13-09-2022


Dr. Bheemanagouda N Patil
M.Sc., Ph.D.

Assistant Professor
HOD of Botany
Smt. A.S.M. College for Women
Ballari-583103.


PRINCIPAL
Smt. ASM College
For Women, BALLARI,


IOAC
CO-ORDINATOR
Smt. Allum Sumangamma Memorial
College For Women, BELLARY.



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	56 hrs	3hrs	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, objective and scope of Plant Anatomy, Plant cell structure – nature of plant cell wall.
Tissue and tissue systems - meristematic tissue, permanent tissue and secretory cells.
 Classification of meristem: (apical, intercalary and lateral), primary and secondary meristem.
Apical meristem: Theories on organization of meristem (apical cell theory, Tunica-Corpus theory, histogen theory and Korper-Kappe theory), quiescent centre, Root cap.
 Evolution and concept of organization of shoot apex (Apical cell theory, Histogen theory, Tunica Corpus theory continuing meristematic residue, cytohistological zonation).

Unit II: MORPHOGENESIS AND DIFFERENTIATION

14 Hrs.

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

Applications in systematics, forensics and Pharmacognosy.

DEVELOPMENT BIOLOGY

Unit III: Morphogenesis and Differentiation

14 Hrs.

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

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

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

Transition from vegetative apex into reproductive apex

Developmental patterns at flowering apex: ABC model specification of floral organs. Modification of gene action by growth hormones and cellular differences between floral organs. Senescence – a general account.

Unit IV: Reproductive Biology

14 Hrs.

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

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

Microsporogenesis - Microspore mother cells, microspore tetrads, Pollinia.

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

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

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

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

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



B.Sc. BOTANY: Semester - 3

Practical: Discipline Specific Core Course (DSCC)

Title of the Course and Code:

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	3hrs	25	25	50

LIST OF EXPERIMENT TO BE CONDUCTED

Practical No.1

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

Practical No.2

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

Practical No.3

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

Practical No. 4

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

Practical No. 5

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

Practical No. 6

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

Practical No. 7

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

Practical No. 8



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

Practical No. 09

Histochemical localization of proteins/ carbohydrates

Practical No. 10 and 11

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

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

Text Books for Reference:

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



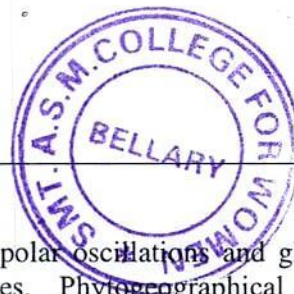
N. N. Bhandari The Microsporangium
F. Bouman The Ovule
M. T. M. Willemse, J. L. van Went The Female Gametophyte
R. B. Knox The Pollen Grain
J. L. van Went, M. T. M. Willems Fertilization



B.Sc. BOTANY 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	Topics	Teaching Hours
I	<p>Introduction to Ecology and Conservation Biology: Definitions, Principles of Ecology, Brief History, Major Indian Contributions, Scope and importance. Ecological levels of organisation.</p> <p>Ecological factors: Climatic factors: light, temperature, precipitation and humidity. Edaphic factors: Soil and its types, soil texture, soil profile, soil formation; physico-chemical properties of soil - mineral particle, soil pH, soil aeration, organic matter, soil humus and soil microorganisms. Topographic Factors: Altitude</p> <p>Ecological groups of plants and their adaptations: Morphological and anatomical adaptations of hydrophytes, xerophytes, epiphytes and halophytes.</p>	15 hrs
II	<p>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 cycle- Phosphorus. Ecological succession: Definition, types- primary and secondary. General stages of succession. Hydrosere and xerosere.</p> <p>Community Ecology: Community and its characteristics – frequency, density, Abundance, cover and basal area, phenology, stratifications, life-forms. Concept of Ecotone and Ecotypes. Intra-specific and Inter-specific interactions with examples.</p> <p>Ecological methods and techniques: Methods of sampling plant communities – transects and quadrates. Remote sensing as a tool for vegetation analysis, land use – land cover mapping.</p> <p>Population Ecology: Population and its characteristics – Population density, natality, mortality, age distribution, population growth curves and dispersal.</p>	15 hrs



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

SUGGESTED REFERENCE BOOKS:

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



List of Practicals 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 <i>Pistia</i> , <i>Eichhornia</i> , <i>Hydrilla</i> , <i>Nymphaea</i> . Anatomical adaptations in <i>Hydrilla</i> (stem) and <i>Nymphaea</i> (petiole).
4	Xerophytes: Morphological adaptations in <i>Asparagus</i> , <i>Casuarina</i> , <i>Acacia</i> , <i>Aloe vera</i> , <i>Euphorbiatirucalli</i> . Anatomical adaptations in phylloclade of <i>Casuarina</i> .
5	Epiphytes: Morphological adaptations in <i>Acampe</i> , <i>Bulbophyllum</i> , <i>Drynaria</i> . Anatomical adaptations in epiphytic root of <i>Acampe/ Vanda</i> . Halophytes: study of Viviparyin mangroves, Morphology and anatomy of Pneumatophores.
6	Study of a pond/forest ecosystem and recording the different biotic and abiotic components
7	Demonstration of different types of vegetation sampling methods – transects and quadrats. Determination of Density and frequency.
8	Application of remote sensing to vegetation analysis using satellite imageries
9	Field visits to study different types of local vegetations/ecosystems and the report to be written in practical record book.
10	Determination of water holding capacity of soil samples
11	Determination of Biological oxygen demand (BOD)
12	Determination of Chemical oxygen demand (COD)
13	Determination of soil texture of different soil samples.



**MODEL BOTANY QUESTION PAPER PATTERN FOR B.SC.III / IV SEM.
THEORY EXAMINATION**

Time: 3hrs

Total Marks: 60

- Instruction:** 1. Part A all questions compulasary
2. Part-B Answer any five full questions
3. Draw daigram where is necessary, unlabelled daigram no marks

PART – A

- I. Answer the following questions** **1×10=10**
- a.
 - b.
 - c.
 - d.
 - e.
 - f.
 - g.
 - h.
 - i.
 - j.

PART-B

- II. Write any five full question of the following** **5×10=50**
- Q 2. a) 10m
 - b)
 - Q 3. a) 10m
 - b)
 - Q 4. a) 10m
 - b)
 - Q 5. a) 10m
 - b)
 - Q 6. a) 10m
 - b)
 - Q 7. a) 10m
 - b)
 - Q 8. a) 10m
 - b)



MARKS PATTERN FOR THEORY INTERNAL ASSESSMENT

C1 First test (10 M)	C2 Second test (10 M)	Assignment/Case study/ Field study (5 M)	Seminor (5M)	Attendance (5M)	Total (40M)

Note: Total 40 marks is consider for the theory internal assessment;
M-Marks



MODEL BOTANY QUESTION PAPER PATTERN FOR B.SC.III SEM. PRATICAL EXAMINATION

Time: 03 Hrs.

Max. Marks: 25

1. Prepare the temporary T.S. of material (Plant Materials) 'A' and identify with reasons (Leave the observation for examiner) 5
2. Mount the endosperm/ embryo of materials 'B' draw and label the diagram (Leave the observation for examiner) 5
3. Macerate the specimen 'C' and identify any two elements with labelled diagram 4
4. Mount the specimen 'D' with neat labelled diagram 3
5. Identify and describe the slides E, F, G and H 8

Scheme for practical examination

- A. Any stem material
- B. Cucumber/chilli seeds
- C. Macerated plant material of cucumber/ Trigonella
- D. Pollinia-Calatropis; Stomata-Trandescantia leaf
- E. and F- Anatomy permanent slides
- G and H-Embryology slides

PRACTICAL INTERNAL ASSESSMENT

C ₁			C ₂			Total (50 M)	Average (25)
First test (15 M)	Record (5 M)	Assignment (5 M)	First test (15 M)	Record (5 M)	Assignment (5 M)		

Note: Conduct the two practical internal examinations as per tabular column; finally consider the average marks for practical internal assessment.



MODEL BOTANY QUESTION PAPER PATTERN FOR B.SC. IV SEM. PRATICAL EXAMINATION

Time: 03 Hrs.

Max. Marks: 25

1. Identify & assign the plant 'A' to its respective ecological group. Explain morphological adaption with labelled diagrams 5
2. Identify & assign the plant 'B' to its respective ecological group. Explain anatomical adaption with labelled diagrams 5
3. Determination of BOD / COD by given 'C' water samples 5
4. Determination of pH by given 'D' soil / water samples 4
5. Identify and comments on the given slides/ Ecological instruments E, F and G 6

Scheme for practical examination

- A. Any plant material
- B. Any plant material
- C. Pond or Tap water
- D. Any type of soil and water sample
- E. and F- Ecological permanent slides
- G any ecological instruments

PRACTICAL INTERNAL ASSESSMENT

C ₁			C ₂			Total (50 M)	Average (25)
First test (15 M)	Record (5 M)	Assignment (5 M)	First test (15 M)	Record (5 M)	Assignment (5 M)		

Note: Conduct the two practical internal examinations as per tabular column; finally consider the average marks for practical internal assessment.


Dr. Bheemananda N Patil
A.Sc., Ph.D.
Assistant Professor
HOD of Botany
Smt. A.S.M. College for Women
Ballari-583103.


IQAC
CO-ORDINATOR
Smt. Allum Sumangamma Memorial For Women, BALLARI,
College For Women, BELLARY.


PRINCIPAL
Smt. ASM College
For Women, BALLARI.

[Handwritten signature]
Dr. Bhramananda M. Halli
Ph.D.

Assistant Professor
HOD of Botany
Sri. A.S.M. College for Women
Ballari-583103.

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