

**BOARD OF STUDIES IN B.Sc BOTANY
2021-2022**

**DEPARTMENT OF BOTANY, MICROBIOLOGY
AND HORTICULTURE**

SYLLABUS FOR B.Sc BOTANY



PITHAPUR RAJAH'S GOVERNMENT COLLEGE

Autonomous and Accredited with 'A' Grade by NAAC (3.17 CGPA)
KAKINADA – 533 001, E G Dist., ANDHRA PRADESH

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III B.Sc., -Botany-V / V Semester End (W.E.F. 2021-22)

CELL BIOLOGY, GENETICS AND PLANT BREEDING (COURSE: BO5207)

Total hours of Teaching 40hrs @ 3 hrs/week

Total Credits:03

UNIT – I: Cell Biology

(12h)

1. Cell, the unit of life- Cell theory, Prokaryotic and eukaryotic cells; Eukaryotic cell components.
2. Ultra structure and functions of cell wall and cell membranes.
3. Chromosomes: morphology, organization of DNA in a chromosome (nucleosome model), Euchromatin and heterochromatin.

UNIT – II: Genetic Material:

(12h)

1. DNA structure (Watson & Crick model) and replication of DNA (semi-conservative)
2. Types of RNA (mRNA, tRNA, rRNA), their structure and function.
3. Polymorphism of DNA.

UNIT – III: Mendelian Inheritance:

(12h)

1. Mendel's laws of Inheritance (Mono- and Di- hybrid crosses); backcross and test cross.
2. Chromosomal mapping – 2-point & 3-point test cross.
3. Linkage: concept, complete and incomplete linkage, coupling and repulsion
4. Crossing Over: concept & significance, Mitotic Crossingover.

UNIT – IV: Plant Breeding:

(12h)

1. Introduction and Objectives of plant breeding.
2. Methods of crop improvement: Procedure, advantages and limitations of Introduction, Selection, and Hybridization (outlines only).

UNIT – V: Breeding, Crop Improvement and Biotechnology:

(12h)

1. Role of mutations in crop improvement.
2. Role of somaclonal variations in crop improvement.
3. Molecular breeding – use of DNA markers in plant breeding and crop improvement (RAPD, RFLP).

Suggested activity: Seminar, Debate, Quiz, observation of live cells and nucleus in Onion peels, observation of Meiotic nuclei in Maize pollen. Solving Genetics problems.

Books for Reference:

- Old, R.W. and Primrose S.B. 1994, Principles of Gene Manipulation Blackwell Science, London
- Grierson, D. and Convey S.N. 1989, Plant Molecular Biology, Blackie Publishers, New York.
- Lea, P.J. and Leegood R.C. 1999, Plant Biochemistry and Molecular Biology, John Wiley and Sons, London.
- Power C.B., 1984, Cell Biology, Himalaya Publishing Co. Mumbai
- De. Robertis and De Robertis, 1998, Cell and Molecular Biology, K.M. Varghese and Company
- Sinnott, E.W., L.C. Dunn & J. Dobshansky (1958):Principles of Genetics (5th Edition)McGraw Hill Publishing Co., N.Y. Toronto, London.
- Winchester, A.M. (1958):Genetics (3rd Edition) Oxford & IBH Publishing House, Calcutta, Bombay, New Delhi.
- Singleton, R. (1963): Elementary Genetics, D. Van Nostrand Co., Ltd., Inc., N.Y. & Affiliated East West Press (P) Ltd., New Delhi.
- Strickberger, M.W. (1976): Genetics (2nd Edition) MacMillan Publishing Co., Inc., N.Y., London
- Watson, J.D. (1977): Molecular Biology of the Gene, W.A. Benjamin, Inc., Menlo Park- California, Reading-Massachusetts, London, Amsterdam, Don Mills, Ontario, Sydney.
- Gardner,E.J & Snusted, D.P.(1984): Principles of Genetics (7thedition) John Wiley & Sons, N.Y. Chichester, Brisbane, Toronto, Singapore.
- Lewin, B. (1985) Genes VII Wiley Eastern Ltd., New Delhi, Bombay, Calcutta, Madras, Hyderabad.
- Allard R.W(1999): The Principles of Plant Breeding, John & Wiley and Sons.
- Poelman J.M: Breeding Field Crops, Springer.
- George Acquaaah (2012): Principles of Plant Genetics & Breeding: Wiley-Blackwell.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III B.Sc., BOTANY PRACTICAL PAPER – V PRACTICAL SYLLABUS
CELL BIOLOGY, GENETICS AND PLANT BREEDING

Total hours of laboratory Exercises 45 hrs @ 2hrs/week

Total credits:02

PAPER – V PRACTICAL SYLLABUS

Suggested Laboratory Exercises:

1. Study of the structure of cell organelles through photomicrographs.
2. Study of structure of plant cell through temporary mounts.
3. Study of various stages of mitosis using cytological preparation of Onion root tips.
4. Study of effect of organic solvent on permeability of cell membrane.
5. Numerical problems solving Mendel's Laws of inheritance
6. Chromosome mapping using 3-point test cross data.
7. Hybridization techniques – emasculation, bagging (for demonstration only).
8. Field visit to a plant breeding research station.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III B.Sc., Botany Practical Examinations at the End of Semester-V
(CELL BIOLOGY, GENETICS AND PLANT BREEDING)
Botany Practical Model Paper-V (w.e.f 2021-22)

Time: 2 hours

Max. Marks: 50

Perform the Experiment **A. Perform** squash on onion root tip, prepare the slide, identify at least one division stage. Write the procedure and draw the diagram of reported stage.

	1 x 15 =	15Marks	Describe the procedure of Hybridization
technique B	1 x 10 =	10Marks	Solving numerical problems on Mendelian in
heritance C, D	2 x 7.5 =	15Marks	Record & Viva
	=	10Marks	

50 Marks

A-Onion root squash technique

B- Emasculation & Bagging

C&D Numerical problems on Mendelian Inheritance.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III Year B.Sc., Degree Examinations at V Semester End
Botany Paper V: CELL BIOLOGY GENETICS AND PLANT BREEDING
(Course: BO5207 Model Paper w.e.f. 2021-22)

Time: 2½ Hrs.

Max. Marks: 60

SECTION – A

3×10 =30M

Answer any **THREE** of the following by choosing atleast one question from each Part., draw neat and labeled diagrams wherever necessary.

PART – I

1. a) Ultra structure and functions of cell membrane
OR
b) Organization of DNA in chromosome
2. a) Watson&Crick model of DNA (OR) Explain about secondary structure of DNA
OR
b) Replication of DNA especially Semiconservative model
3. a) Chromosome mapping (OR) 3 Point test cross
OR
b) Linkage concept and significance

PART – II

4. a) Methods of crop improvement
OR
b) Introduction and objectives of plant breeding
5. a) Role of Soma clonal variations
OR
b) Role of Mutations in crop improvement

SECTION – B

4×5=20M

Answer any **FOUR** of the following Questions, Draw neat and labeled diagrams wherever necessary

1. Difference between Prokaryotic and Eukaryotic cell
2. m-RNA Structure and Functions
3. Crossing Over theories
4. Selection in Plant breeding
5. Significance of Mutations in Plant breeding

SECTION – C

5×2=10M

Answer **ALL** Questions

1. Chromatids
2. DNA polymerase
3. Auto polyploidy
4. Emasculation
5. NBPGR

BLUE PRINT FOR QUESTION SETTER

UNIT NO/TITLE	LAQ	SAQ	VSAQ	Marks allotted to the Module
UNIT –I: CELL BIOLOGY	1	1	1	17
UNIT-II: GENETIC MATERIAL	1	1	1	17
UNIT-III: MENDELIAN INHERITANCE	1	1	1	17
UNIT-IV: PLANT BREEDING	1	1	1	17
UNIT-V : BREEDING, CROP IMPROVEMENT AND BIOTECHNOLOGY	1	1	1	17
Total marks allotted to all question including choice				85

Note: Question paper setters are requested to adhere strictly to the above blue print while preparing the said paper

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III B.Sc., -Botany-V / V Semester End (W.E.F. 2021-22)
CELL BIOLOGY, GENETICS AND PLANT BREEDING
III B.Sc., -Botany-5 / V Semester Question Bank

UNIT – I: CELL BIOLOGY

Essay Questions-

1. Ultra Structure and functions of cell wall?
2. Organization of DNA in chromosome
3. Ultra structure and functions of cell membrane

Short Answer Questions

1. Cell theory
2. Difference between Prokaryotic and Eukaryotic cell
3. Fluid Mosaic Model of Cell membrane
4. Euchromatin, Heterochromatin

Very Short Notes.

1. Plasmodesmata
2. Protoplast
3. Middle lamella
4. Active transport
5. Centromere
6. Telomere
7. Chromatids
8. Karyotype
9. Idiogram
10. Nucleosome
11. Babianirings

UNIT – II: GENETIC MATERIAL

Essay Questions-

1. Watson&Crick model of DNA (OR) Explain about secondary structure of DNA
2. Replication of DNA especially Semiconservative model

Short Answer Questions

1. m-RNA Structure and Functions
2. t-RNA structure and Functions

Very Short Notes.

1. Pramidines
2. Purins
3. Bacteriophage
4. Nucleoside
5. Nucleotide
6. DNA polymerase
7. DNA grades
8. Replicon
9. m- RNA
10. r-RNA

UNIT – III: MENDELIAN INHERITANCE

Essay Questions-

1. Chromosome mapping (OR) 3 Point test cross
2. Linkage concept and significance

Short Answer Questions

1. Back cross
2. Test cross
3. Crossing Over theories

Very Short Notes.

1. Back cross
2. Test cross
3. Linkage
4. Crossing over
5. Nullisomic
6. Trisomic
7. Chiasma
8. Auto polyploidy
9. Euploidy
10. Tetraploidy

UNIT – IV: PLANT BREEDING

Essay Questions-

1. Methods of crop improvement
2. Introduction and objectives of plant breeding

Short Answer Questions

1. Objectives of Plant breeding
2. Selection in Plant breeding

Very Short Notes.

1. NBPGR
2. Pureline selection
3. Clones
4. Emasculation
5. Bagging
6. Pedigree
7. RAPD
8. RFLP
9. MAS
10. Mutagened

UNIT – V: BREEDING, CROP IMPROVEMENT AND BIOTECHNOLOGY

Essay Questions-

1. Role of Mutations in crop improvement
2. Role of Somaclonal variations
3. Molecular Breeding

Short Answer Questions

1. RFLP/Restriction Fragment Length Polymorphism
2. RAPD/ Rapid Amplified Polymorphic DNA
3. Hybridization of plant breeding
4. Significance of Mutations in Plant breeding

Very Short Notes.

1. RFLP
2. RAPD
3. Role of Mutations in Plant Breeding
4. Any Two advantages of Soma Clonal Variations

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III B.Sc., -Botany-VI / V Semester End (W.E.F. 2021-22)
ADVANCED ELECTIVE

PLANT ECOLOGY & PHYTOGEOGRAPHY (COURSE: BO5208)

Total hours of Teaching 40hrs @ 3 hrs/week

Total Credits:03

UNIT – I: Elements of Ecology (12h)

1. Ecology: definition, branches and significance of ecology.
2. Climatic Factors: Light, Temperature.
3. Edaphic Factor: Origin, formation, composition and soil profile.
4. Biotic Factor: Interactions between plants and animals.

UNIT– II: Ecosystem Ecology (12h)

1. Ecosystem: Concept and components, energy flow, Food chain, Food web, Ecological pyramids.
2. Productivity of Ecosystem-Primary, Secondary and Net productivity.
3. Biogeochemical cycles- Carbon, Nitrogen and Phosphorous.

UNIT – III: Population &Community Ecology (12h)

1. Population -definition, characteristics and importance, outlines –ecotypes.
2. Plant communities- characters of a community, outlines – Frequency, density, cover, life forms, competition.
3. Interaction between plants growing in a community.

UNIT – IV: Phytogeography (12h)

1. Principles of Phytogeography, Distribution (wides, endemic, discontinuous species)
2. Phytogeographic regions of India.
3. Phytogeographic regions of World.
4. Endemism – types and causes

UNIT- V: Plant Biodiversity and its importance (12h)

1. Definition, levels of biodiversity-genetic, species and ecosystem.
2. Biodiversity hotspots- Criteria, Biodiversity hotspots of India.
3. Loss of biodiversity – causes and conservation (*In-situ* and *ex-situ* methods).
4. Seed banks - conservation of genetic resources and their importance

Suggested activity: Collection of different soils, studying their texture, observing polluted water bodies, student study projects, debates on man's activity on ecosystem and biodiversity conservation methods, visiting a nearest natural vegetation area. Visit to NGO, working in the field of biodiversity and report writing; to study Honey Bees and plants yielding honey.

Books for Reference:

- Daubenmire, R.F. (): Plants & Environment (2nd Edn.,) John Wiley & Sons., New York
- Puri. G.S. (1960): Indian Forest Ecology (Vol.I & II) Oxford Book Co., New Delhi & Calcutta.
- Billings, W.B. (1965): Plants and the Ecosystem Wadsworth Publishing Co., Inc., Belmont.
- Misra, R. (1968): The Ecology work Book Oxford & INH Publishing Co., Calcutta
- Odum E.P. (1971): Fundamentals of Ecology (2nd Edn.,) Saunders & Co., Philadelphia & Natraj Publishers, Dehradun.
- Odum E.P. (1975): Ecology by Holt, Rinert & Winston.
- Oosting, H.G. (1978): Plants and Ecosystem Wadworth Belmont.
- Kochhar, P.L. (1975): Plant Ecology. (9th Edn.,) New Delhi, Bombay, Calcutta-226pp.
- Kumar, H.D. (1992): Modern Concepts of Ecology (7th Edn.,) Vikas Publishing Co., New Delhi
- Kumar H.D. (2000): Biodiversity & Sustainable Conservation Oxford & IBH Publishing Co Ltd. New Delhi.
- Newman, E.I. (2000): Applied Ecology Blackwell Scientific Publisher, U.K.
- Chapman, J.L&M.J. Reiss (1992): ecology (Principles & Applications). Cambridge University Press, U.K.
- Cain, S.A. (1944): Foundations of Plant Geography Harper & Brothers, N.Y.
- Mani, M.S (1974): Ecology & Biogeography of India Dr. W. Junk Publishers, The Hague
- Good, R. (1997): The Geography of flowering Plants (2nd Edn.) Longmans, Green & Co., Inc., London & Allied Science Publishers, New Delhi

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III B.Sc., BOTANY PRACTICAL PAPER – VI PRACTICAL SYLLABUS
PLANT ECOLOGY & PHYTOGEOGRAPHY

Total hours of laboratory Exercises 45 hrs @ 2hrs/week

Total credits:02

1. Study of instruments used to measure microclimatic variables; soil thermometer, maximum and minimum thermometer, anemometer, rain gauge, and lux meter.
2. Permeability (percolation; total capacity as well as rate of movement) of different soil samples.
3. Determination of soil pH
4. Study of morphological and anatomical adaptations of hydrophytes and xerophytes (4 each)
5. Determination of minimal quadrat size for the study of herbaceous vegetation in the college campus by species area curve method
6. Study of Phytoplankton and macrophytes from water bodies.
7. To study field vegetation with respect to stratification, canopy cover and composition.
8. Study of plants included in agro forestry and social forestry.
9. To locate the hotspots, phyto geographical regions and distribution of endemic plants in the map of India.
10. The following practical should be conducted in the Field/lab with the help of photographs, herbarium, Floras, Red data book- Study of endangered plants species, critically endangered plants species, vulnerable plant species and monotypic endemic genera of India.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III B.Sc., Botany Practical Examinations at the End of Semester-V
(PLANT ECOLOGY & PHYTOGEOGRAPHY)
Botany Practical Model Paper-VI (w.e.f 2021-22)

Time: 2 hours

Max. Marks: 50

- | | | |
|---|---|-----------------|
| 1. Study Project under supervision | = | 15 Marks |
| 2. Record & Viva-Voce | = | 10 Marks |
| 3. Experiment A | = | 10 Marks |
| 4. Anatomical adaptations of B (Section cutting) | = | 10 Marks |
| 5. Spotters C&D (2x2 1/2) | = | 05 Marks |

Total	=	50 Marks
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1. Study Project of a surrounding Ecosystem (terrestrial or aquatic) (plant diversity, animal diversity, human activity, pollution levels, restoration efforts under supervision.
2. Presentation of the project work in Q & A session.
3. **A** -determination of soil porosity/PH/percolation/retaining capacity.
4. **B**- Xerophyte/Hydrophyte anatomical adaptations.
5. **C & D**-anemometer/rain gauge/lux meter.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III Year B.Sc., Degree Examinations at V Semester End
Botany Paper VI: PLANT ECOLOGY & PHYTOGEOGRAPHY
(Course: BO5208 Model Paper w.e.f. 2021-22)

Time: 2½ Hrs.

Max. Marks: 60

SECTION – A

3×10 =30M

Answer any **THREE** of the following by choosing atleast one question from each Part., draw neat and labeled diagrams wherever necessary.

PART - I

1. a) Explain about climate factors i.e. Light, Temperature
OR

b) Explain about interaction between plants and animals

2. a) Explain about Nitrogen Cycle

OR

b) Explain about Production Ecology

3. a) Explain about Community Ecology

OR

b) Explain about Population Ecology

PART - II

4. a) Write about Phytogeographic regions of India
OR

b) Explain about Endemism

5. a) Explain about Biodiversity hotspots in India

OR

b) Explain about loss of biodiversity

SECTION – B

4×5=20M

Answer any **FOUR** of the following Questions, Draw neat and labeled diagrams wherever necessary

1. Symbiosis
2. Ecological pyramids
3. Ecotypes
4. Principles of phytogeography
5. Conservation methods in biodiversity

SECTION – C

5×2=10M

Answer **ALL** Questions

1. Ecotone
2. Biogeo- chemicals cycling
3. Population
4. Paleo endemism
5. IUCN

BLUE PRINT FOR QUESTION SETTER

UNIT NO/TITLE	LAQ	SAQ	VSAQ	Marks allotted to the Module
UNIT –I: ELEMENTS OF ECOLOGY	1	1	1	17
UNIT-II: ECOSYSTEM ECOLOGY	1	1	1	17
UNIT-III: POPULATION &COMMUNITY ECOLOGY	1	1	1	17
UNIT-IV: PHYTOGEOGRAPHY	1	1	1	17
UNIT-V : PLANT BIODIVERSITY AND ITS IMPORTANCE	1	1	1	17
Total marks allotted to all question including choice				85

Note: Question paper setters are requested to adhere strictly to the above blue print while preparing the said paper

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III B.Sc.-Botany-VI / V Semester End (W.E.F. 2021-22)
PLANT ECOLOGY & PHYTOGEOGRAPHY
III B.Sc.-Botany-VI / V Semester Question Bank

UNIT – I: Elements of Ecology

Essay Questions

1. Explain about climate factors i.e. Light, Temperature
2. Explain about interaction between plants and animals

Short Questions

1. Soil profile
2. Symbiosis

Very Short Notes.

1. Ecology
2. Biome
3. Ecotone
4. Climax
5. Synecology
6. Palaecology
7. Habitate ecology
8. Biomass
9. Biosphere
10. Pedalogy
11. Mycorrhiza
12. Humus
13. Mesophytes
14. Halophytes
15. Myrmecophily
16. Epiphytes
17. Mutualism

UNIT– II: Ecosystem Ecology

Essay Questions

1. Explain about Production Ecology
2. Explain about Nitrogen Cycle

Short Question

1. Food chain
2. Ecological pyramids
3. Phosphorous cycle

Very Short Notes.

1. Ecosystem
2. Stratification
3. Decomposers
4. Abiotic
5. Leaf area index
6. Nitrogen fixation

7. Ammonification
8. Denitrification
9. Biogeo-chemicals cycling
10. Consumers

UNIT – III: Population & Community Ecology

Essay Questions

1. Explain about Community Ecology
2. Explain about Population Ecology

Short Questions

1. Ecotypes
2. Competition
3. Frequency

Very Short Notes.

1. Population
2. Natality
3. Mortality
4. Density
5. Frequency
6. Emigration
7. Ecards
8. Therophytes
9. Geophytes/ Cryptophytes
10. Biological spectrum
11. Ecotone
12. Edge effect

UNIT – IV: Phytogeography

Essay Questions

1. Write about Phytogeographic regions of India
2. Explain about Endemism

Short Questions

1. Discontinuous species
2. Principles of phytogeography

Very Short Notes.

1. Endemic
2. Wides
3. Neo- endemism
4. Pseudo- endemism
5. Endemic flag species
6. Endemic keystone species
7. Endangered species
8. Holoendemism
9. Paleoendemism
10. GBC(geographical concept)
11. EBC(Epibiotics concept)

UNIT- V: Plant Biodiversity and its importance

Essay Questions

1. Explain about levels of biodiversity
2. Explain about Biodiversity hotspots in India
3. Explain about loss of biodiversity

Short Questions

1. Seed Banks
2. Conservation methods in biodiversity

Very Short Notes.

1. Biodiversity
2. UNCBD
3. UNED
4. ALPHA Diversity
5. BETA Diversity
6. Gamma Diversity
7. Genetic Diversity
8. Species Diversity
9. Hotspots
10. IUCN
11. UNEP
12. WWF
13. NBPGR
14. Seed bank & Gene bank