

GOVERNMENT COLLEGE (AUTONOMOUS)

RAJAMAHENDRAVARAM

(ESTD: 1853, NAAC Re-Accredited with Grade 'A+')

DEPARTMENT OF BOTANY



BOARD OF STUDIES MEETING

2021-2022

**GOVERNMENT COLLEGE (AUTONOMOUS) RAJAMAHENDRAVARAM
DEPARTMENT OF BOTANY**

Allocation of Credits at Subject Level 2021-2022

Course Structure: B.Sc.

Subject: Botany

S. No.	Paper No and Code	Paper	Title of the Course (Paper)	Hours /week	Max. Marks(SE E)	Marks in CIA	Credits
FIRST SEMESTER							
1	Paper-I BOT -157	Theory	Fundamentals of Microbes and Non-vascular Plants	03	50	50	02
		Practical	Fundamentals of Microbes and Non-vascular Plants	03	50	Internal	02
SECOND SEMESTER							
2	Paper-II BOT - 158	Theory	Basics of Vascular plants and Phytogeography	04	50	50	03
		Practical	Basics of Vascular plants and Phytogeography	03	50	External	02
THIRD SEMESTER							
3.	Paper-III BOT -106	Theory	Anatomy and Embryology of Angiosperms, Plant Ecology and Biodiversity	04	50	50	03
		Practical	Anatomy and Embryology of Angiosperms, Plant Ecology and Biodiversity	03	50	Internal	02
FOURTH SEMESTER							
4	Paper-IV BOT -121	Theory	Plant Physiology and Metabolism	04	50	50	03
		Practical	Plant Physiology and Metabolism	03	50	External 1	02
5.	Paper-5 BOT - 128	Theory	Cell Biology, Genetics, and Plant Breeding.	03	50	50	03
		Practical	Cell Biology, Genetics, and Plant Breeding.	03	50	External 2	02

**GOVERNMENT COLLEGE (AUTONOMOUS) RAJAHMUNDRY
DEPARTMENT OF BOTANY**

BOARD OF STUDIES MEETING: 2021-2022

The Board of Studies Meeting of the Department of **BOTANY** was convened at **11:00 AM** on **-09-2021** under the Chairmanship of Prof. J. Suneetha with the following members.

S.No.	Designation	Name	Signature
1.	Chairman	Prof. J. Suneetha Professor & HOD Dept of Botany	
2.	University Nominee	Dr.G.Prasanna Kumari, DNR College (A), Bhimavaram	
3.	Subject Expert	Dr.K. Sarala, Principal Scientist, CTRI, RJY	
4.	Subject Expert	P.Prayaga Murthy, Lecturer in Botany, GDC Yeleswaram, EG.Dist.	
5.	Industrial Nominee	Dr. P. Rama Krishna, Director, Sri Satyadeva Nursery, Kadiapulanka.	
6.	Faculty Member	D.Madhu Sudhakar, Lecturer in Botany	
7.	Faculty Member	K.Gani Raju, Lecturer in Botany	
8.	Faculty Member	B.Bujji Babu, Lecturer in Botany.	
9.	Student Nominee	S. Sandhya III BBC EM	

**CHAIRMAN,
BOARD OF STUDIES**

**GOVERNMENT COLLEGE (AUTONOMOUS) RAJAHMUNDRY
DEPARTMENT OF BOTANY**

Name	Signature of Members Present
1. Prof. J. Suneetha	
2. Dr. G. Prasanna Kumari	
3. Dr. K. Sarala	
4. P. Prayaga Murthy	
5. Sri.D.Madhu sudhakar	
6. Sri. K. Gani Raju	
7. B.Bujji Babu	
8. S. Sandhya	III BBC E.M

**CHAIRMAN
BOARD OF STUDIES**

GOVERNMENT COLLEGE (AUTONOMOUS) RAJAHMUNDRY
DEPARTMENT OF BOTANY

FUTURE PLANS: 2021-2022

1. Digitalization of Herbarium.
2. Conducting of Field Trips / Botanical Tours.
3. Cultivation of Vegetables and Leafy vegetables.
4. Organization of Exhibitions
5. Arrangement of Guest Lectures
6. Organization of Workshop / Seminar
7. National workshop on Modern trends in Horticulture.
8. Conduction of Training programs.
9. Preparation of Seed banks.
10. Maintenance of Mist chamber and Polyhouse.
11. Development of Horticulture gardens
12. Introduce Bachelor of Vocational Courses in Horticulture
13. Organization of Webinars

GOVERNMENT COLLEGE (AUTONOMOUS) RAJAHMUNDRY

DEPARTMENT OF BOTANY

Model Blue Print for the Question paper and choice for I and II B.Sc. - Botany

(w.e.f. 2020-21 Academic Year)

S.No.	Type of Questions	To be given in the Question paper			To be answered		
		No. of Questions	Marks allotted to each question	Total marks	No. of Questions	Marks allotted to each question	Total marks
1	SECTION - A Short Answer Questions (SAQ)	10	04	40	05	04	20
2	SECTION - B Long Answer Questions (LAQ)	05	10	50	03	10	30
Total questions & Total marks =		15	-	90	08	-	50

$$\text{Percentage of choice given} = \frac{90 - 50}{100} \times 100 = \frac{40}{100} \times 100 = 40\%$$

GOVERNMENT COLLEGE (AUTONOMOUS) RAJAHMUNDRY
DEPARTMENT OF BOTANY

The **Board of Studies in Botany** for the academic year **2021 - 2022** convened on **09-2021** at 11:00 AM in Dept. of Botany, Govt. College (A), Rajahmundry.

AGENDA:

1. Modification of syllabus compared to previous year.
2. Department Action Plan for 2021-22.
3. Approval of model question papers and Blue prints.
4. Approval of panel of question paper setters and Examiners.
5. Pedagogy implementation w.e.f. admitted batch 2021-22.
6. Additional inputs to curriculum.
7. Internal assessment weight age is 50% for First and second year and 40% for third year.
8. Implementing Cluster electives/Subject electives.
9. Semester end examinations are 2½ Hrs. and 50 marks for I & II year students.
Continuous Internal Assessment (CIA) 50 Marks.
10. Conduct of semester wise practical examinations for all the 3 years.
11. Introduction of restructured course - B.Sc. Agriculture and rural development program with effect from 2021-2022 Academic Year.
12. The members of B.O.S. in Botany discussed all the issues kept in the agenda at length and taken following resolutions.

RESOLUTIONS:

1. Resolved to offer all courses of Botany under CBCS pattern for students of all the three years as approved in the BOS meeting.
2. Resolved to approve the implementation of CIA for 50 marks and Semester end evaluation for 50 marks in theory examinations for all the First and Second year of B.Sc. Program;

Theory Semester End examinations	
External	50 Marks
Continuous Internal Assessment	50 Marks
Break up for CIA	
Mid semester Exam	20Marks(Direct Assessment)
Online Exam	10 Marks(Direct Assessment)
Attendance	05 Marks(75%and above=1 Mark /month)
Assignment	05 Marks (Indirect Assessment)
Pedagogical techniques (<u>Demonstration</u> /Field work/ Quiz/GD/JAM etc.)	10Marks (Indirect Assessment)

3. It is resolved to conduct practical examinations at every semester end for 50 Marks. Practical examinations for I/III Semesters are of Internal Evaluation. At the end of II/IV Semesters practical examinations are of External Evaluation.
4. It is resolved to approve 40% pass minimum in both theory and practical examinations for all the 3 years of students.
5. Resolved to offer Certificate course as a mandatory for I year students. The syllabus and model question paper of the said add on course are approved.
6. Resolved to approve the model question papers and blue prints of theory and practical for all the 6 semesters of Botany.
7. Resolved to approve the panel of Paper setters and Examiners for Botany.
8. Resolved to approve the Action plan of the Department for the academic year 2021-2022.
9. Resolved to approve a part time/Visiting faculty from the same subject area should be engaged to take classes of Horticulture
10. Resolved to approve the conduction of Botanical and Educational tours, Field trips, Training Programs, Workshops, Seminars, Exhibitions, Webinars and Guest lectures etc...

**GOVERNMENT COLLEGE (AUTONOMOUS) RAJAHMUNDRY
DEPARTMENT OF BOTANY**

LIST OF PAPER SETTERS AND EXAMINERS

1. **Dr. G. PRASANNA KUMARI**
HOD, DNR College, Bhimavaram
2. **Dr. P. PRAYAGA MURTHY,**
GDC YELESWARAM.
3. **Smt. M. SULAKSHANA,**
Ideal Degree College, Kakinada
4. **Dr. MALLIKHARJUN,**
D.N.R. College (Autonomous) Bhimavaram.
5. **Smt. K. USHASRI,**
GDC, Ramachandrapuram
6. **Dr. BHUPATHI RAYALU,**
GDC, Rajole
7. **Dr. B. SITA LAKSHMI,**
V.S. Krishna Government College (A), Visakhapatnam.
8. **Sri. K. NAGESWARA RAO**
ASD. Govt. Degree College, Kothapeta
9. **Smt. G.R.N.S .SUJATHA**
ASD. Govt. College (W), Kakinada
10. **Sri. CH. SRINIVASA REDDY**
SRR & CVR. Govt. Degree College (A), Vijayavada.

GOVERNMENT COLLEGE (AUTONOMOUS) RAJAHMUNDRY

S. No.	Name	Signature of Members Present
1.	Prof. J. Suneetha	
2.	Dr. G. Prasanna Kumari	
3.	Dr. K. Sarala	
4.	Dr.P.Prayaga Murthy	
5.	Dr. P. Rama Krishna	
6.	D. Madhu Sudhakar	
7.	K. Gani Raju	
8.	B. Bujji Babu	
9.	S. Sandhya III BBC EM	

**CHAIRMAN
BOARD OF STUDIES**

BOT-159
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM
I B.Sc - SEMESTER- I: Botany Core Course - 1 Theory Syllabus
(w.e.f 2020-2021 admitted batch)
Paper- I: Fundamentals of Microbes and Non-vascular Plants
(Viruses, Bacteria, Fungi, Lichens, Algae and Bryophytes)
Total hours of Teaching 60 hrs@ 4 hours per a week

Course objectives:

- ❖ Explain origin of life on the earth.
- ❖ Illustrate diversity among the viruses and prokaryotic organisms and can categorize them.
- ❖ Classify fungi, lichens, algae and bryophytes based on their structure, reproduction and life cycles.
- ❖ Analyze and ascertain the plant disease symptoms due to viruses, bacteria and fungi.
- ❖ Recall and explain the evolutionary trends among amphibians of plant kingdom for their shift to land habitat.
- ❖ Evaluate the ecological and economic value of microbes, thallophytes and bryophytes.

Unit - 1: Origin of life and Viruses

12Hrs.

1. Origin of life, concept of primary Abiogenesis; Miller and Urey experiment. Five kingdom classification of R.H. Whittaker
2. Discovery of microorganisms, Pasteur experiments, germ theory of diseases.
3. Shape and symmetry of viruses; structure of Bacteriophage TMV and Gemini virus; replication of Bacteriophage; A brief account of Prions and Viroids.
4. A general account on symptoms of plant diseases caused by Viruses. Transmission of plant viruses and their control.
5. Types of Vaccines.

Unit - 2: Special groups of Bacteria and Eubacteria

12Hrs.

1. Brief account of Archaeobacteria, Actinomycetes and Cyanobacteria.
2. Cell structure and Gram staining of Bacteria.
3. Reproduction- Asexual (Binary fission and endospores) and bacterial recombination (Conjugation, Transformation, Transduction).
4. Economic importance of Bacteria with reference to their role in Agriculture and industry (fermentation and medicine).
5. A general account on plant diseases caused by Bacteria; Citrus canker.

Unit - 3: Fungi & Lichens

12 Hrs.

1. General characteristics of fungi and Ainsworth classification (upto classes).
2. Structure, reproduction and life history of (a) Rhizopus (Zygomycota) and (b) Puccinia (Basidiomycota).
3. Mushroom Cultivation (Paddy straw)
4. Economic uses of fungi in food industry, pharmacy and agriculture.
5. Lichens-Types, structure and reproduction; ecological and economic importance.

Unit - 4: Algae**12 Hrs.**

1. General characteristics of Algae (pigments, flagella and reserve food material); Fritsch classification (upto classes).
2. Thallus organization in Algae.
3. Occurrence, structure, reproduction and life cycle of (a) Nostoc (b) Spirogyra (Chlorophyceae) and (c) Polysiphonia (Rhodophyceae).
4. Economic importance of Algae.

Unit - 5: Bryophytes**12 Hrs.**

1. General characteristics of Bryophytes; classification upto classes.
2. Occurrence, morphology, anatomy, reproduction (developmental details are not needed) and life cycle of (a) Marchantia (Hepaticopsida) and (b) Funaria (Bryopsida).
3. General account on evolution of sporophytes in Bryophyta.

Deviation of the Syllabus

Sl. No	Unit No.	Addition	Deletion
1	1	a. Structure of Bacteriophage, b. Replication of Bacteriophage. c. Types of Vaccines	a. Multiplication of TMV
2	2	Gram staining of Bacteria	a.Nutrition in Bacteria. b.General account on symptoms of plant diseases caused by bacteria.
3	3	a.Mushroom cultivation (Paddy Straw Mushroom) b.Lichen Types	General account on symptoms of plant diseases caused by fungi, Blast of rice
4	4	Nostoc	Life cycles in Algae.

Learning Outcomes

On completion of this course, the students will be able to: Develop understanding on the concept of microbial nutrition

- Study of Viral Characteristics and their disease symptoms.
- Develop critical understanding of plant diseases and their remediation.
- Examine the general characteristics of bacteria and their cell reproduction
- Algae and their economic importance.
- Conduct experiments using skills appropriate to subdivision.
- Identify true fungi and demonstrate the principles and application of plant pathology in the control of plant disease.
- Develop an understanding of microbes, fungi and lichens and appreciate their adaptive strategies.
- Mushroom cultivation is one of the entrepreneurship and create self-employability.
- Identify the common plant diseases caused by microorganisms and their control.

Text books:

- Botany - I (Vrukshasastram-I): Telugu Akademi, Hyderabad.
- Pandey, B.P. (2013) College Botany, Volume-I, S. Chand Publishing, New Delhi
- Hait,G., K.Bhattacharya-&A.K.Ghosh (2011) A Text Book of Botany, Volume-I, New Central Book Agency Pvt. Ltd., Kolkata.
- Bhattacharjee, R.N., (2017) Introduction to Microbiology and Microbial Diversity, Kalyani Publishers, New Delhi.

Books for Reference:

- Dubey, R.C. &D.K.Maheswari (2013) A Text Book of Microbiology, S.Chand& Company Ltd., New Delhi.
- Pelczar Jr., M.J., E.C.N. Chan &N.R.Krieg (2001)Microbiology, Tata Mc Graw Hill Co, New Delhi.
- Presscott, L. Harley, J. and Klein, D. (2005) Microbiology, 6th edition, Tata McGraw -Hill Co. New Delhi.
- Alexopoulos, C.J., C.W.Mims-&M.Blackwell (2007) Introductory Mycology, Wiley& Sons, Inc., New York.
- Mehrotra, R.S. & K. R. Aneja (1990) An Introduction to Mycology. New Age International Publishers, New Delhi.
- Kevin Kavanagh (2005) Fungi; Biology and Applications John Wiley & Sons, Ltd., West Sussex, England.
- John Webster & R. W. S. Weber (2007) Introduction to Fungi, Cambridge University Press, New York.
- Fritsch, F.E. (1945)The Structure & Reproduction of Algae (Vol. I & Vol. II) Cambridge University Press Cambridge, U.K

BOT-159

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

I B.Sc - SEMESTER- I: Botany Core Course - 1 Model Question Paper (w.e.f. 2020-21)

Paper- I: Fundamentals of Microbes and Non-vascular Plants

(Viruses, Bacteria, Fungi, Lichens, Algae and Bryophytes)

Time : 2 1/2 Hrs.

Max. Marks: 50

Section -A

5 x 4=20 M

Answer any Four of the following questions. Draw diagrams wherever necessary.

1. concept of primary Abiogenesis
2. Tobacco Mosaic Virus
3. Binary fission in Bacteria
4. Citrus canker
5. Pigments in Algae
6. *Economic importance of Algae*
7. General characteristics of fungi
8. Economic importance of Lichens
9. Marchantia thallus
10. Economic importance of Lichens

Section - B

3 x 10 =30 M

Answer any Three of the following questions. Draw neat labeled diagrams wherever necessary.

11. Give an account on Origin of life.
12. Discuss different modes of nutrition in Bacteria.
13. Discuss about the range of thallus structure in algae.
14. Describe the life cycle of *Puccinia*
15. Write an essay on evolution of sporophytes in Bryophyta.

BOT-159
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM
I B.Sc - SEMESTER- I: Botany Core Course - 1 Model Question Paper (w.e.f. 2020-21)
Paper- I: Fundamentals of Microbes and Non-vascular Plants
(Viruses, Bacteria, Fungi, Lichens, Algae and Bryophytes)

Blue Print for Question Paper

Unit	Essay Question (10M)	Short Question (5M)
01	01	02
02	01	01
03	01	02
04	01	02
05	01	01

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

BOT-159
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM
I B.Sc - SEMESTER- I: Botany Core Course - I Practical Syllabus
(w.e.f 2020-2021 admitted batch)
Fundamentals of Microbes and Non-vascular Plants
(Viruses, Bacteria, Fungi, Lichens, Algae and Bryophytes)
(Total hours of laboratory exercises 30 Hrs. @ 02 Hrs./Week)

1. Knowledge of Microbiology laboratory practices and safety rules.
2. Knowledge of different equipment for Microbiology laboratory (Spirit lamp, Inoculation loop, Hot-air oven, Autoclave/Pressure cooker, Laminar air flow chamber and Incubator) and their working principles.
3. Gram's staining technique for Bacteria experiment by students hands on training.
4. Study of Viruses (Corona, Gemini and TMV) using electron micrographs/ models.
5. Study of Archaeobacteria and Actinomycetes using permanent slides/ electron micrographs/diagrams.
6. Study of Anabaena and Oscillatoria using permanent/temporary slides.
7. Study of different bacteria (Cocci, Bacillus, Vibrio and Spirillum) using permanent or temporary slides/ electron micrographs/ diagrams.
8. Study/ microscopic observation of vegetative, sectional/anatomical and reproductive structures of the following using temporary or permanent slides/ specimens/ mounts :
 - a. Fungi : Rhizopus, Puccinia and Mushroom
 - b. Lichens: Crustose, foliose and fruiticose
 - c. Algae :Nostoc, Spirogyra and Polysiphonia
 - d. Bryophyta : Marchantia and Funaria
9. Study of specimens of Tobacco mosaic disease, Citrus canker

BOT-159
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM
I B.Sc - SEMESTER -I
(w.e.f 2020-2021 admitted batch)
BOTANY PRACTICAL PAPER -I

Paper-1 P: Microbial Diversity, Algae and Fungi

Time: 3hrs.

Max. Marks: 50

1. Identify giving reasons two of the given **Algal mixture** "A". Leave your preparation for evaluation. Draw labeled diagrams. (Slide--1mark, Diagrams--1mark, Identification--1mark) **2 x 5= 10 Marks**

1. Take the T.S. of material '**B**' (Fungi/ Bryophyta), make a temporary mount and make comment about identification. (Section cutting-5 marks, Identification-1 Mark, Notes- 2 marks, diagrams-2 marks, **10 Marks**

3. Perform Gram staining of the given Bacterial culture. **10 Marks**
4. Write critical notes and Identify D, E, F, G **4X3= 12 Marks**
5. Record and Viva- voce **5+3=08 Marks**

Total: 50 Marks

Key:

- A. Algal material
- B. Fungi/ Bryophyta
- C. Gram staining of Bacteria.
- D. One of the instruments of Micro biology laboratory.
- E. Virus/ Bacteria/ Plant Diseases.
- F. Whole specimen or a permanent slide of Algae/ Fungi.
- G. Lichen .

BOT-160
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM
I B.Sc., - Botany-2/ II Semester End(W.E.F. 2020-2021)
Basics of Vascular plants and Phytogeography
(Pteridophytes, Gymnosperms, Taxonomy of Angiosperms and Phytogeography)
Total Hrs. of Teaching-Learning: 60 @ 4 h / Week Total Credits: 03

Unit - 1: Pteridophytes 12 Hrs.

1. General characteristics of Pteridophyta; classification of Smith (1955) upto divisions.
2. Occurrence, morphology, anatomy, reproduction (developmental details are not needed) and life history of (a) Lycopodium (Lycopsida) and (b) Marsilea (Filicopsida).
3. Stellar evolution in Pteridophytes;
4. Heterospory and seed habit

Unit - 2: Gymnosperms 14 Hrs.

1. General characteristics of Gymnosperms; Sporne classification upto classes.
2. Occurrence, morphology, anatomy, reproduction (developmental details are not needed) and life history of (a) Cycas (Cycadopsida) and (b) Gnetum (Gnetopsida).
3. Outlines of geological time scale. 4. A brief account on Cycadeoidea.

Unit - 3: Basic aspects of Taxonomy 13Hrs.

1. Aim and scope of taxonomy; Species concept: Taxonomic hierarchy, species, genus and family.
2. Plant nomenclature: Binomial system, ICBN- rules for nomenclature.
3. Herbarium and its techniques, BSI herbarium and Kew herbarium; concept of digital herbaria. 4. Bentham and Hooker system of classification;
4. Systematic description and economic importance of the following families: (a) Annonaceae (b) Curcubitaceae

Unit - 4: Systematic Taxonomy 13 Hrs.

1. Systematic description and economic importance of the following families: (a) Asteraceae (b) Asclepiadaceae (c) Amaranthaceae (d) Euphorbiaceae (e) Arecaceae and (f) Poaceae
2. Outlines of Angiosperm Phylogeny Group (APG IV)

Unit - 5: Phytogeography 08 Hrs.

1. Principles of Phytogeography, Distribution (wides, endemic, discontinuous species)
2. Endemism - types and causes.
3. Phytogeographic regions of World.
4. Phytogeographic regions of India.
5. Vegetation types in Andhra Pradesh.

Text books:

- Botany – I (Vrukshasastram-I) : Telugu Akademi, Hyderabad
- Botany – II (Vrukshasastram-II) : Telugu Akademi, Hyderabad
- Acharya, B.C., (2019) Archchegoniates, Kalyani Publishers, New Delhi
- Bhattacharya, K., G. Hait & Ghosh, A. K., (2011) A Text Book of Botany, Volume II, New Central Book Agency Pvt. Ltd., Kolkata
- Hait, G., K. Bhattacharya & A. K. Ghosh (2011) A Text Book of Botany, Volume-I, New Central Book Agency Pvt. Ltd., Kolkata
- Pandey, B.P. (2013) College Botany, Volume-I, S. Chand Publishing, New Delhi
- Pandey, B.P. (2013) College Botany, Volume-II, S. Chand Publishing, New Delhi

Books for Reference:

- Smith, G.M. (1971) Cryptogamic Botany Vol. II., Tata McGraw Hill, New Delhi
- Sharma, O.P. (2012) Pteridophyta. Tata McGraw-Hill, New Delhi
- Kramer, K.U. & P. S. Green (1990) The Families and Genera of Vascular Plants, Volume –I: Pteridophytes and Gymnosperms (Ed. K. Kubitzki) Springer-Verlag, New York
- Bhatnagar, S.P. & Alok Moitra (1996) Gymnosperms. New Age International, New Delhi
- Coulter, J.M. & C.J. Chamberlain (1910) Morphology of Gymnosperms, The University of Chicago Press, Chicago, Illinois
- Govil, C.M. (2007) Gymnosperms: Extinct and Extant. KRISHNA Prakashan – Media (P) Ltd. Meerut & Delhi
- Sporne, K.R. (1971) The Morphology of Gymnosperms. Hutchinsons Co. Ltd., London
- Arnold, C.A., (1947) An introduction to Paleobotany McGraw –Hill Book – Company, INC, New York
- Stewart, W.N., and G.W. Rothwell (2005) Paleobotany and the evolution of plants – Cambridge University Press, New York
- Lawrence, George H.M. (1951) Taxonomy of Vascular Plants. The McMillan Co., New York
- Heywood, V. H. and D. M. Moore (1984) Current Concepts in Plant Taxonomy. – Academic Press, London.
- Jeffrey, C. (1982) An Introduction to Plant Taxonomy. Cambridge University – Press, Cambridge. London.
- Sambamurty, A.V.S.S. (2005) Taxonomy of Angiosperms I. K. International Pvt. – Ltd., New Delhi
- Singh, G. (2012). Plant Systematics: Theory and Practice. Oxford – & IBH Pvt. Ltd., New Delhi.
- Simpson, M.G. (2006). Plant Systematics. Elsevier Academic Press, San Diego, – CA, U.S.A.
- Cain, S.A. (1944) Foundations of Plant Geography Harper – & Brothers, N.Y.
- Good, R. (1997) The Geography of flowering Plants (2nd Edn.) Longmans, Green – & Co., Inc., London & Allied Science Publishers, New Delhi

Learning Outcomes:

On successful completion of this course, the students will be able to:

- Classify and compare Pteridophytes and Gymnosperms based on their morphology, anatomy, reproduction and life cycles.
- Justify evolutionary trends in tracheophytes to adapt for land habitat. Explain the process of fossilization and compare the characteristics of extinct and extant plants.
- Critically understand various taxonomical aids for identification of Angiosperms. Analyze the morphology of the most common Angiosperm plants of their localities and recognize their families.
- Evaluate the ecological, ethnic and economic value of different tracheophytes and summarize their goods and services for human welfare.
- Locate different phytogeographical regions of the world and India and can analyze, their floristic wealth.

BOT-160

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM
I B.Sc., - Botany-2/ II Semeste End(W.E.F. 2020-2021)
Basics of Vascular plants and Phytogeography
(Pteridophytes, Gymnosperms, Taxonomy of Angiosperms and Phytogeography
Model Question Paper (w.e.f. 2020-21)

Time: 2 ½ Hrs.

Max. Marks: 50

Section -A

5 x 4=20 M

Answer any Four of the following questions. Draw diagrams wherever necessary.

1. Asclepiadaceae floral structure
2. Morphology of *Funaria* Gametophore
3. Heterospory in Pteridophytes
4. Morphology of *Marseliasporocarp*
5. ICBN- rules
6. General characters of Gymnosperms
7. Economic importance of Annonaceae
8. Outlines of Angiosperm Phylogeny Group
9. Significance of Ecology
10. *Endemism - types*

Section - B

3 x 10 =30 M

Answer any Three of the following questions. Draw neat labeled diagrams wherever necessary.

11. Write an essay on Bentham and Hooker's system of classification.
12. Write an essay on Stelar evolution in Pteridophytes.
13. Write an essay on the structure of ovule in *Gnetum*.
14. Describe the distinguishing characters of the family Cucurbitaceae and mention its economic importance.
15. Write an essay on phytogeographic regions of India.

BOT-160
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY

Basics of Vascular plants and Phytogeography
(Pteridophytes, Gymnosperms, Taxonomy of Angiosperms and Phytogeography)

Blue Print

Unit no./ Title	SAQ	LAQ	Marks allotted to the Module
Unit - 1/ Pteridophyta	2	1	18
Unit - 2/ Gymnosperms	2	1	18
Unit - 3/ Basic aspects of Taxonomy	2	1	18
Unit - 4/ Systematic Taxonomy	2	1	18
Unit - 5/ Phytogeography	2	1	18
Total marks allotted to all questions including choice =			90

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

BOT-160

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

I B.Sc., - Practical syllabus of Botany Core Course - 2/ Semester - II

Basics of Vascular plants and Phytogeography

(Pteridophytes, Gymnosperms, Taxonomy of Angiosperms and Phytogeography)

(Total hours of laboratory exercises 30 Hrs. @ 02 Hrs. /Week)

1. Study/ microscopic observation of vegetative, sectional/ anatomical and reproductive structures of the following using temporary or permanent slides/ specimens/ mounts :
 - a. Pteridophyta : Lycopodium and Marselia
 - b. Gymnosperms : Cycas and Gnetum
2. Study of fossil specimens of Cycadeoidea and Pentoxylon (photographs / diagrams can be shown if specimens are not available).
3. Demonstration of herbarium techniques.
4. Systematic / taxonomic study of locally available plants belonging to the families prescribed in theory syllabus. (Submission of 30 number of Herbarium sheets of wild plants with the standard system is mandatory).
5. Mapping of phytogeographical regions of the globe and India.

BOT-160

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM
I B.Sc., Botany Practical Examinations at the end of II Semester

Basics of Vascular plants and Phytogeography
(Pteridophytes, Gymnosperms, Taxonomy of Angiosperms and Phytogeography)
Botany Practical Paper - I I model (w.e.f. 2020-21)

Time: 3 hours

Max. Marks: 50

1. Take T.S. of the material 'A' (Pteridophyta), make a temporary slide and justify the identification with apt points. 10 M
2. Take T.S. of the material 'B' (Gymnosperms), make a temporary slide and justify the identification with apt points. 10 M
3. Describe the vegetative and floral characters of the material 'C' (Taxonomy of Angiosperms) and derive its systematic position. 10 M
4. Identify the specimen 'D' (Fossil Gymnosperm) and give specific reasons. 5 M
5. Locate the specified phytogeographical regions (2x2M) in the world / India (E) map supplied to you. 4 M
6. Record + Herbarium & Field note book + Viva-voce 5 +4+3 = 12 M

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM
I B.Sc., Botany Practical Examinations at the end of II Semester
Basics of Vascular plants and Phytogeography
(Pteridophytes, Gymnosperms, Taxonomy of Angiosperms and Phytogeography)

Suggested co-curricular activities for Botany Core Course-2 in Semester-II:

Measurable:

A. Student seminars:

1. Fossil Pteridophytes.
2. Aquatic ferns and tree ferns
3. Ecological and economic importance of Pteridophytes
4. Evolution of male and female gametophytes in Gymnosperms.
5. Endemic and endangered Gymnosperms.
6. Ecological and economic importance of Gymnosperms.
7. Floras and their importance: Flora of British India and Flora of Madras Presidency.
8. Botanical gardens and their importance: National Botanic garden and Royal Botanic garden.
9. Artificial, Natural and Phylogenetic classification systems.
10. Molecular markers used in APG system of classification.
11. Vessel less angiosperms.
12. Insectivorous plants.
13. Parasitic angiosperms.
14. Continental drift theory and species isolation.

B. Student Study Projects:

1. Collection and identification of Pteridophytes from their native locality/ making an album by collecting photographs of Pteridophytes.
2. Collection and identification of Gymnosperms from their native locality/ making an album by collecting photographs of Gymnosperms.
3. Collection of information on famous herbaria in the world and preparation of a report.
4. Collection of information on famous botanic gardens in the world and preparation of a report.
5. Collection of data on vegetables (leafy and fruity) plants in the market and and preparation of a report on their taxonomy.
6. Collection and identification of fresh and dry fruits plants in the market and and preparation of a report on their taxonomy.
7. Collection of data on plants of ethnic and ethnobotanical importance from their native locality.
8. Preparation of a local flora by enlisting the plants of their native place.

C. Assignments:

Written assignment at home / during '0' hour at college; preparation of charts with drawings, making models etc., on topics included in syllabus.

General:

1. Visit to Botanic garden in a Research institute/University to see the live plants.
2. Virtual tour in websites for digital herbaria and botanic gardens.
3. Acquaint with standard floras like – Flora of Madras Presidency, Flora of their respective district in Andhra Pradesh.
4. Looking into vegetation of different phytogeographical regions using web resources.
5. Group Discussion (GD)/ Quiz/ Just A Minute (JAM) on different modules in syllabus of the course

BOT -106
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM
II B.Sc., - Botany - 3 / III Semester End (W.E.F. 2020-21)

Anatomy and Embryology of Angiosperms, Plant Ecology and Biodiversity
Total Hrs. of Teaching-Learning: 60 @ 4 h / Week **Total Credits: 03**

Theory:

Learning outcomes:

On successful completion of this course, the students will be able to;

- Understand on the organization of tissues and tissue systems in plants.
- Illustrate and interpret various aspects of embryology.
- Discuss the basic concepts of plant ecology, and evaluate the effects of environmental and biotic factors on plant communities.
- Appraise various qualitative and quantitative parameters to study the population and community ecology.
- Correlate the importance of biodiversity and consequences due to its loss.
- Enlist the endemic/endangered flora and fauna from two biodiversity hot spots in India and assess strategies for their conservation.

Unit – 1: Anatomy of Angiosperms **12 Hrs.**

1. Organization of apical meristems: Tunica-carpus theory and Histogen theory.
2. Tissue systems–Epidermal, ground and vascular.
3. Anomalous secondary growth in *Boerhaavia* and *Dracaena*.
4. Study of timbers of economic importance - Teak, Red sanders and Rosewood.

Unit – 2: Embryology of Angiosperms **12 Hrs.**

1. Structure of anther, anther wall, types of tapetum. Microsporogenesis and development of male gametophyte.
2. Structure of ovule, megasporogenesis; monosporic (*Polygonum*), bisporic (*Allium*) and tetrasporic (*Peperomia*) types of embryo sacs.
3. Outlines of pollination, pollen – pistil interaction and fertilization.
4. Endosperm - Types and biological importance - Free nuclear, cellular, helobial and ruminant.
5. Development of Dicot (*Capsella bursa-pastoris*) embryo.

Unit – 3: Basics of Ecology

12 Hrs.

1. Ecology: definition, branches and significance of ecology.
2. Ecosystem: Concept and components, energy flow, food chain, food web, ecological pyramids.
4. Plants and environment: Climatic (light and temperature), edaphic and biotic factors.
5. Ecological succession: Hydrosere and Xerosere.

Unit – 4: Population, Community and Production Ecology

12 Hrs.

1. Population ecology: Natality, mortality, growth curves, ecotypes, ecads
2. Community ecology: Frequency, density, cover, life forms, biological spectrum
3. Concepts of productivity: GPP, NPP and Community Respiration
4. Secondary production, P/R ratio and Ecosystems.

Unit – 5: Basics of Biodiversity

12 Hrs.

1. Biodiversity: Basic concepts, Convention on Biodiversity - Earth Summit.
 2. Value of Biodiversity; types and levels of biodiversity and Threats to biodiversity
 3. Biodiversity Hot spots in India. Biodiversity in North Eastern Himalayas and Western Ghats.
 4. Principles of conservation: IUCN threat-categories, RED data book
 5. Role of NBPGR and NBA in the conservation of Biodiversity.
-

Text books:

- Botany – III (Vrukshasastram-I) : Telugu Akademi, Hyderabad
- Botany – IV (Vrukshasastram-II) : Telugu Akademi, Hyderabad
- Pandey, B.P. (2013) *College Botany, Volume-II*, S. Chand Publishing, New Delhi
- Pandey, B.P. (2013) *College Botany, Volume-III*, S. Chand Publishing, New Delhi
- Bhattacharya, K., G. Hait & Ghosh, A. K., (2011) *A Text Book of Botany, Volume-II*, New Central Book Agency Pvt. Ltd., Kolkata

Books for Reference:

- Esau, K. (1971) *Anatomy of Seed Plants*. John Wiley and Son, USA.
- Fahn, A. (1990) *Plant Anatomy*, Pergamon Press, Oxford.
- Cutler, D.F., T. Botha & D. Wm. Stevenson (2008) *Plant Anatomy: An Applied Approach*, Wiley, USA.
- Paula Rudall (1987) *Anatomy of Flowering Plants: An Introduction to Structure and Development*. Cambridge University Press, London
- Bhojwani, S. S. and S. P. Bhatnagar (2000) *The Embryology of Angiosperms (4th Ed.)*, Vikas Publishing House, Delhi.
- Pandey, A. K. (2000) *Introduction to Embryology of Angiosperms*. CBS Publishers & Distributors Pvt. Ltd. , New Delhi
- Maheswari, P. (1971) *An Introduction to Embryology of Angiosperms*. McGraw Hill Book Co., London.
- Johri, B.M. (2011) *Embryology of Angiosperms*. Springer-Verlag, Berlin
- Pandey, B.P. (2013) *College Botany, Volume-III*, S. Chand Publishing, New Delhi
- Bhattacharya, K., A. K. Ghosh, & G. Hait (2011) *A Text Book of Botany, Volume-IV*, New Central Book Agency Pvt. Ltd., Kolkata
- Kormondy, Edward J. (1996) *Concepts of Ecology*, Prentice-Hall of India Private Limited, New Delhi
- Begon, M., J.L. Harper & C.R. Townsend (2003) *Ecology*, Blackwell Science Ltd., U.S.A.
- Eugene P. Odum (1996) *Fundamentals of Ecology*, Natraj Publishers, Dehradun
- Sharma, P.D. (2012) *Ecology and Environment*. Rastogi Publications, Meerut, India.
- N.S.Subrahmanyam & A.V.S.S. Sambamurty (2008) *Ecology* Narosa Publishing House, New Delhi

- A. K. Agrawal & P.P. Deo (2010) *Plant Ecology*, Agrobios (India), Jodhpur
- Kumar, H.D. (1992) *Modern Concepts of Ecology (7th Edn.,)* Vikas Publishing Co., 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.

- Kumar H.D. (2000) *Biodiversity & Sustainable Conservation* Oxford & IBH Publishing Co Ltd. New Delhi.
- U. Kumar (2007) *Biodiversity : Principles & Conservation*, Agrobios (India), Jodhpur

BOT -106

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM
II B.Sc., - Botany - 3 / III Semester End (W.E.F. 2020-21)

Anatomy and Embryology of Angiosperms, Plant Ecology and Biodiversity

Model Question Paper (w.e.f. 2021-22)

Time: 2 ½ Hrs.

Max. Marks: 50

Section -A

5 x 4=20 M

Answer any Four of the following questions. Draw diagrams wherever necessary.

1. Tunica Carpus Theory
2. Rose wood
3. Tapetum tissue
4. Endosperm
5. Food web
6. Energy flow
7. Ecotypes
8. NBPGR

Section - B

3 x 10 =30 M

Answer any Three of the following questions. Draw neat labeled diagrams wherever necessary.

9. Write an essay on Anomalous .secondary growth in Boerhaavia.
10. Write an essay on the development of Dicot embryo.
11. Write an essay on ecological pyramids.
12. Write about the characteristics of a population.
13. Write about the Biodiversity hotspots in India.

BOT -106

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

II B.Sc., - Botany - 3 / III Semester End (W.E.F. 2021-22)

Anatomy and Embryology of Angiosperms, Plant Ecology and Biodiversity

Blue Print

Unit no. / Title	SAQ	LAQ	Marks allotted to the Module
Unit - 1 / Anatomy of Angiosperms	2	1	20
Unit - 2 / Embryology of Angiosperms	2	1	20
Unit - 3 / Basics of Ecology	2	1	20
Unit - 4 / Population, Community and Production ecology	1	1	15
Unit - 5 / Basics of Biodiversity	1	1	15
Total marks allotted to all questions including choice =			90

BOT -106

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM
II B.Sc., – Botany - 3 / III Semester End (W.E.F. 2020-21)

Anatomy and Embryology of Angiosperms, Plant Ecology and Biodiversity

Practical syllabus of Botany

(Total hours of laboratory exercises 30 Hrs. @ 02 Hrs./Week)

Course Outcomes:

On successful completion of this practical course students shall be able to:

1. Get familiarized with techniques of section making, staining and microscopic study of vegetative, anatomical and reproductive structure of plants.
2. Observe externally and under microscope, identify and draw exact diagrams of the material in the lab.
3. Demonstrate application of methods in plant ecology and conservation of biodiversity and qualitative and quantitative aspects related to populations and communities of plants.

Practical Syllabus

1. Tissue organization in root and shoot apices using permanent slides.
2. Anomalous secondary growth in stems of *Boerhavia* and *Dracaena*.
3. Study of anther and ovule using permanent slides/photographs.
4. Study of pollen germination and pollen viability.
5. Dissection and observation of Embryo sac haustoria in *Santalum* or *Argemone*.
6. Structure of endosperm (nuclear and cellular) using permanent slides / Photographs.
7. Dissection and observation of Endosperm haustoria in *Crotalaria* or *Coccinia*.
8. Developmental stages of dicot and monocot embryos using permanent slides / photographs.
9. Study of instruments used to measure microclimatic variables; soil thermometer, maximum and minimum thermometer, anemometer, rain gauge, and lux meter. (visit to the nearest/local meteorology station where the data is being collected regularly and record the field visit summary for the submission in the practical).
10. Study of morphological and anatomical adaptations of hydrophytes and xerophytes (02 each).
11. Quantitative analysis of herbaceous vegetation in the college campus for frequency, density and abundance.

12. Identification of vegetation/various plants in college campus and comparison with Raunkiaer's frequency distribution law.
13. Find out the alpha-diversity of plants in the area
14. Mapping of biodiversity hotspots of the world and India.

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM
II B.Sc., - Botany - 3 / III Semester End (W.E.F. 2020-21)

Anatomy and Embryology of Angiosperms, Plant Ecology and Biodiversity

Practical Model paper

Max. Time: 3 Hrs.

Max. Marks: 50

1. Take T.S. of the material 'A' (Anatomy), prepare a temporary slide and justify the identification with specific reasons. 10 M
2. Write the procedure for the experiment 'B' (Embryology) and demonstrate the same. 10 M
3. Take T.S. of the material 'C', prepare a temporary slide and justify the identification with specific reasons. 10 M
4. Identify the following with specific reasons. 4 x 3 = 12 M
 - D. Anatomy/Embryology
 - E. Ecology instrument
 - F. Mapping of Biodiversity hot spot
 - G. Endemic/endangered plant/animal
5. Record + Viva-voce 5 + 3 = 8 M

Suggested co-curricular activities for Botany Core Course-3 in Semester-III:

A. Measurable :

a. Student seminars :

1. Anatomy in relation to taxonomy of Angiosperms.
2. Nodal anatomy
3. Floral anatomy
4. Embryology in relation to taxonomy of Angiosperms.
5. Apomictics and polyembryony.
6. Biogeochemical cycles- Carbon, Nitrogen and Phosphorous.
7. Deforestation and Afforestation.
8. Green house effect and ocean acidification.
9. The Montreal protocol and the Kyoto protocol.
10. Productivity of aquatic ecosystems.
11. Mangrove ecosystems in India.
12. Kollerulake – Ramsar site.
13. Biodiversity hotspots of the world.
14. Origin of Crop plants - Vavilov centers
15. Agrobiodiversity
16. International organizations working on conservation of Biodiversity
17. Nagoya protocol – ABS system.
18. Endemic and endangered plants in Andhra Pradesh.

b. Student Study Projects:

1. Stomata structure in plants from college campus/ their native place.
2. Report on xylem elements in plants using maceration technique.
3. Collection of information on famous herbaria in the world and preparation of a report.
4. Microscopic observations on pollen morphology from plants in college Campus/ their native locality.
5. Study report on germination and viability of pollen in different plants.
6. Observation of anthesis time in different plants and their pollinators.
7. A report on autecology and synecology of some plants in college campus or their native place.
8. Collection of photos of endemic/endangered plant and animal species to Makean album.

9. Biodiversity of the college or their own residential/ native area.
10. Collection of seeds/vegetative organs of rare plant species from their localities and to raise/grow in college garden

c. **Assignments:** Written assignment at home / during '0' hour at college; preparation of charts with drawings, making models etc., on topics included in syllabus.

B. General:

1. Visit to an arboretum / silviculture station/Forest research institute to see the live timber yielding plants or to visit a local timber depot. to observe various woods.
2. Field visit to a nearby ecosystem to observe the abiotic-biotic relationships.
3. Visit to National park/Sanctuary/Biosphere reserve etc., to observe in-situ conservation of plants and animals.
4. Visit to a Botanical garden or Zoo to learn about ex-situ conservation of rare plants or animals.
5. Group Discussion (GD)/ Quiz/ Just A Minute (JAM) on different modules

BOT -121
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY
II B.Sc., - Botany -4/ IV Semester End (w.e.f. 2018-19)
Plant Physiology and Metabolism

Total Hrs. of Teaching-Learning: 60 @ 4 h / Week **Total Credits : 03**

Unit - 1 **Plant - Water relations** **(12 h)**

1. Importance of water to plant life, physical properties of water, diffusion, imbibition and Osmosis.
2. Absorption and lateral transport of water; Ascent of sap -Various Theories
3. Transpiration : Definition, types of transpiration
4. Stomata structure; opening and closing mechanism of stomata.

Unit - 2 **Mineral nutrition and Enzymes** **(12 h)**

1. Essential macro and micro mineral nutrients and their role in plants; symptoms of mineral deficiency.
2. Uptake of mineral ions - passive and active transport.
3. Nitrogen fixation- Types, biological nitrogen fixation in *Rhizobium*.
4. Enzymes: General characteristics, mechanism of enzyme action and factors regulating enzyme action.

Unit - 3 **Plant metabolism - I** **(12 h)**

1. Photosynthesis: Photosynthetic pigments, absorption and action spectra; Red drop and Emerson enhancement effect.
2. Concept of two photosystems; mechanism of photosynthetic electron transport and evolution of oxygen; photophosphorylation
3. Carbon assimilation pathways (C₃, C₄ and CAM).
4. Photorespiration and its significance.

Unit - 4 **Plant metabolism - II** **(12 h)**

1. Respiration: Aerobic and Anaerobic processes; Glycolysis, Krebs cycle.
2. Electron Transport System, mechanism of oxidative phosphorylation,
3. Lipid metabolism : Introduction, classification of lipids.

Unit - 5 **Plant growth and Development** **(12 h)**

1. Growth and Development: Definition, phases and kinetics of growth.
2. Physiological effects of phytohormones- Auxins, Gibberellins, Cytokinins, ABA, Ethylene .
3. Physiology of Flowering : Photoperiodism, role of Phytochrome in flowering; Vernalization.

Learning outcomes:

- Students can acquire knowledge about the need of water for plant life
- Students can gain knowledge about the process of photosynthesis and Respiration.
- One can gain knowledge about the role of enzymes in plant metabolism.
- Students can know the importance of plant growth hormones in plant growth and development.

Employability:

- Students can apply the knowledge about the role of mineral nutrients in plant growth and development and plant growth hormones and their importance to maintain a nursery and can create his or her self employability.

Suggested Readings:

- **Subhash Chandra Datta (2007)** *Plant Physiology*, New Age International, New Delhi
- **Pandey, S.M. & B.K. Sinha (2006)** *Plant Physiology*, Vikas Publishing House, New Delhi
- **R.K. Sinha (2014)** *Modern Plant Physiology*, Narosa Publishing House, New Delhi
- **S.C. Datta (2007)** *Plant Physiology*, New Age International (P) Ltd., Publishers, New Delhi
- **Aravind Kumar & S.S. Purohit (1998)** *Plant Physiology - Fundamentals and Applications*, Agro Botanica, Bikaner
- **Mukherjee, S. & A.K. Ghosh (1998)** *Plant Physiology*, Tata McGraw Hill Publishers(P) Ltd., New Delhi.

Reference books:

- **Salisbury Frank B. & Cleon W. Ross (2007)** *Plant Physiology*, Thomsen & Wadsworth, Australia & U.S.A
- **Noggle Ray & J. Fritz (2013)** *Introductory Plant Physiology*, Prentice Hall (India), New Delhi
- **Taiz, L. & E. Zeiger (2003)** *Plant Physiology*, Panima Publishers, New Delhi
- **Hans Mohr & P. Schopfer (2006)** *Plant Physiology*, Springer (India) Pvt. Ltd., New Delhi
- **V. Verma (2007)** *Text Book of Plant Physiology*, Ane Books India, New Delhi
- **Hopkins, W.G. & N.P.A. Huner (2014)** *Introduction to Plant Physiology*, Wiley India Pvt. Ltd., New Delhi
- **Hans-Walter heldt (2005)** *Plant Biochemistry*, Academic Press, U.S.A.
- **Plummer, D.(1989)** *Biochemistry—the Chemistry of life*, McGraw Hill Book Co., London, N.Y. New Delhi, Paris, Singapore, Tokyo.
- **Day, P.M.& Harborne, J.B. (Eds.,) (2000):** *Plant Biochemistry*. . Harcourt Asia (P) Ltd., India & Academic Press, Singapore.

BOT - 121
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY
II year B.Sc., Program Examinations at IV Semester End
Botany Paper - 4: Plant Physiology and Metabolism
Model Question Paper (w.e.f. 2020-21)

Time: 3 Hrs.

Max. Marks: 50

Section - A

4 x 5=20 M

Answer any Four of the following questions. Draw diagrams wherever necessary.

1. Imbibition
2. General characteristics of enzymes
3. Emerson enhancement effect
4. Crassulacean Acid Metabolism
5. Anaerobic respiration
6. C₄ Cycle
7. Sigmoid growth curve
8. Vernalization

Section - B

3 x 10=30 M

Answer any Three of the following questions. Draw neat labeled diagrams wherever necessary.

9. Discuss the concept and components of water potential.
10. Describe the mechanism of enzyme action.
11. Write an essay on non-cyclic photophosphorylation.
12. Write an essay on the Classification of lipids
13. Write an essay on the physiological effects of Gibberellins.

BOT - 121
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY
Blue Print

Unit no./ Title	SAQ	LAQ	Marks allotted to the Module
Unit - 1/ Plant - Water relations	2	1	20
Unit - 2/ Mineral nutrition and Enzymes	2	1	20
Unit - 3/ Plant metabolism - 1	2	1	20
Unit - 4/ Plant metabolism - 2	1	1	15
Unit - 5/ Plant growth and development	1	1	15
Total marks allotted to all questions including choice =			90

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

BOT - 121
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY

II B.Sc., Botany Practical Paper - IV Practical Syllabus (w.e.f. 2018-19)
(Plant Physiology and Metabolism)

Total hours of laboratory Exercises 30hrs @ 2 per week Credits 2

1. Determination of osmotic potential by plasmolytic method using leaf epidermal peels of *Rhoeo* or *Tradescantia*.
2. Determination of water potential in potato tuber cylinders by gravimetric method
3. Determination of cell membrane permeability using beet root by colorimetric method
4. Determination of rate of transpiration using cobalt chloride method
5. Determination of rate of transpiration using Ganong's potometer.
6. Determination of amylase activity using germination seeds of green gram
7. Anatomy of C₃, C₄ and CAM leaves
8. Separation of chloroplast pigments using paper chromatography technique.
9. Study of mineral deficiency symptoms using plant material/photographs.
10. Minor experiments -
 - a. Osmosis (Egg membrane/potato osmoscope)
 - b. Cytoplasmic streaming
 - c. Ascent of sap through xylem
 - d. Arc-auxonometer,

BOT - 121
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY
II B.Sc., Botany Practical Examinations at the end of IV Semester
(Plant Physiology and Metabolism)
Botany Model Practical Question Paper - IV (w.e.f. 2020-21)

Time: 3 hours

Max.Marks:50

1. Experiment 'A' Major experiment from Plant-Water relations /Plant metabolism **15 M**

Scheme of valuation: Aim, principle and procedure - 5 M
Conduct of experiment - 6M
Report of result and inference - 4 M

2. Experiment 'B' Minor experiment **07 M**

Scheme of valuation: Aim, principle and procedure - 5 M
Report of result and inference - 2 M

3. Scientific observation and data analysis **4 x 5=20 M**

D. Plant - Water relations
E. Mineral nutrition and Enzymes
F. Plant metabolism
G. Plant growth and development

Scheme of valuation: Identification -1 M + Diagram - 1 M + Reasons/analysis - 3 M

4. Record _ Viva-voce **5 + 3=8 M**

BOT-128

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

II B.Sc., - Botany -5 / IV Semester End (W.E.F. 2018-19)

Cell Biology, Genetics and Plant Breeding

Total Hrs. of Teaching-Learning: 60 @ 4 h / Week

Total Credits: 03

Learning outcomes:

On successful completion of this course, the students will be able to:

- Distinguish prokaryotic and eukaryotic cells and design the model of a cell.
 - Explain the organization of a eukaryotic chromosome and the structure of genetic material.
 - Demonstrate techniques to observe the cell and its components under a microscope.
 - Discuss the basics of Mendelian genetics, its variations and interpret inheritance of traits in living beings.
 - Elucidate the role of extra-chromosomal genetic material for inheritance of characters.
 - Evaluate the structure, function and regulation of genetic material.
 - Understand the application of principles and modern techniques in plant breeding.
 - Explain the procedures of selection and hybridization for improvement of crops.
-

Unit – 1: The Cell

12 Hrs.

1. Cell theory; prokaryotic vs eukaryotic cell; animal vs plant cell; a brief account on ultra-structure of a plant cell.
2. Ultra-structure of cell wall.
3. Ultra-structure of plasma membrane and various theories on its organization.
4. Polymorphic cell organelles (Plastids); ultrastructure of chloroplast. Plastid DNA.

Unit – 2: Chromosomes

12 Hrs.

1. Prokaryotic vs eukaryotic chromosome. Morphology of a eukaryotic chromosome.
2. Euchromatin and Heterochromatin; Karyotype and ideogram.
3. Brief account of chromosomal aberrations - structural and numerical changes
4. Organization of DNA in a chromosome (solenoid and nucleosome models).

Unit – 3: Mendelian and Non-Mendelian genetics

14Hrs.

1. Mendel's laws of inheritance. Incomplete dominance and co-dominance; Multiple allelism.
2. Complementary, supplementary and duplicate gene interactions (plant based

examples are to be dealt).

3. A brief account of linkage and crossing over; Chromosomal mapping - 2 point and 3 point test cross.
4. Concept of maternal inheritance (Corren's experiment on *Mirabilis jalapa*); Mitochondrial DNA.

Unit – 4: Structure and functions of DNA

12 Hrs.

1. Watson and Crick model of DNA. Brief account on DNA Replication (Semi-conservative method).
2. Brief account on Transcription, types and functions of RNA. Gene concept and genetic code and Translation.
3. Regulation of gene expression in prokaryotes - Lac Operon.

Unit – 5: Plant Breeding

12 Hrs.

1. Plant Breeding and its scope; Genetic basis for plant breeding. Plant Introduction and acclimatization.
2. Definition, procedure; applications and uses; advantages and limitations of : (a) Mass selection, (b) Pure line selection and (c) Clonal selection.
3. Hybridization – schemes, and technique; Heterosis (hybrid vigor).
4. A brief account on Molecular breeding – DNA markers in plant breeding. RAPD, RFLP.

Additional inputs for CIA

1. Solenoid Model
2. Mutations, Types, and it's Significance
3. Chromosomal Mapping - 2 Point & 3 Point Test Cross (Assignment/PPT/Model preparation)

Employability:

- Students can create their opportunities in the field of agriculture and Horticulture by studying the process of plant breeding in developing new varieties.
- Knowledge of plant breeding creates opportunities in agriculture sector

Text books :

- Botany – III (Vrukshasastram-I) : Telugu Akademi, Hyderabad
- Pandey, B.P. (2013) *College Botany, Volume-III*, S. Chand Publishing, New Delhi
- Ghosh, A.K., K.Bhattacharya&G. Hait (2011) *A Text Book of Botany, Volume-III*, New Central Book Agency Pvt. Ltd., Kolkata
- Chaudhary, R. C. (1996) *Introduction to Plant Breeding*, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi

Books for Reference:

- S. C. Rastogi (2008)*Cell Biology*,New Age International (P) Ltd. Publishers, New Delhi
- P. K. Gupta (2002)*Cell and Molecular biology*,Rastogi Publications, New Delhi
- B. D. Singh (2008) *Genetics*,Kalyani Publishers, Ludhiana
- A.V.S.S. Sambamurty (2007) *Molecular Genetics*,Narosa Publishing House,New Delhi
- Cooper, G.M. & R.E. Hausman (2009)*The Cell – A Molecular Approach*, A.S.M. Press, Washington
- Becker, W.M., L.J. Kleinsmith& J. Hardin (2007)*The World of Cell*, Pearson Education, Inc., New York
- De Robertis, E.D.P. & E.M.F. De Robertis Jr. (2002)*Cell and Molecular Biology*, Lippincott Williams & Wilkins Publ., Philadelphia
- Robert H. Tamarin (2002) *Principles of Genetics* ,Tata McGraw –Hill Publishing Company Limited, New Delhi.
- Gardner, E.J., M. J. Simmons & D.P. Snustad (2004)*Principles of Genetics*, John Wiley & Sons Inc., New York
- Micklos, D.A., G.A. Freyer& D.A. Cotty (2005) *DNA Science: A First Course*, I.K.International Pvt. Ltd., New Delhi
- Chaudhari, H.K.(1983)*Elementary Principles of Plant Breeding*, TMH publishers Co.,New Delhi
- Sharma, J.R. (1994)*Principles and Practice of Plant Breeding*, Tata McGraw- Hill Publishers, New Delhi
- Singh,B.D. (2001)*Plant Breeding : Principles and Methods* ,Kalyani Publishers, Ludhiana

- Pundhan Singh (2015) *Plant Breeding for Undergraduate Students*, Kalyani Publishers, Ludhiana
- Gupta, S.K. (2010) *Plant Breeding : Theory and Techniques*, Agrobios (India), Jodhpur
- Hayes, H.K., F.R. Immer & D.C. Smith (2009) *Methods of Plant Breeding*, Biotech Books, Delhi

BOT-128
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM
III year B.Sc., Program Examinations at V Semester End
Botany Paper - 5 : Cell Biology, Genetics and Plant Breeding
(Model paper w.e.f. 2018-19)

Time: 3 Hrs.

Max. Marks: 50

Section -A

4 x5 =20 M

Answer any Four of the following questions. Draw diagrams wherever necessary.

1. Cell theory
2. Euchromatin and Heterochromatin
3. t-RNA
4. Characteristics of genetic code
5. Test cross
6. Complete linkage
7. Objectives of plant breeding
8. Somaclonal variations

Section – B

3 x 10 = 30 M

Answer any Three of the following questions. Draw neat and labeled diagrams wherever necessary.

9. Write an essay on the ultra structure and functions of cell membrane.
10. Describe the Watson and Crick model of DNA.
11. Discuss the complementary and inhibitory gene interactions with suitable examples.
12. Discuss the procedure, advantages and limitations of hybridization.
18. Write an essay on the use of molecular markers in plant breeding.

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Botany Paper - 5 : Cell Biology, Genetics and Plant Breeding

Blue Print

Unit no. / Title	SAQ	LAQ	Marks allotted to the Module
Unit - 1/Cell Biology	2	1	20
Unit - 2/ Genetic material	2	1	20
Unit - 3/ Inheritance	2	1	20
Unit - 4/ Plant breeding	1	1	15
Unit - 5/ Breeding, Crop improvement and Biotechnology	1	1	15
			90

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

BOT-128
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

II B.Sc., Botany Practical Paper - V Practical Syllabus (w.e.f. 2020-21)
(Cell Biology, Genetics and Plant breeding)

Total hours of laboratory Exercises 30hrs @ 2 per week Credits 2

1. Study of the structure of cell organelles through photomicrographs.
2. Study of various stages of mitosis using cytological preparation of Onion root tips.
3. Study of structure of chromosomes (typical and special types).
4. Numerical problems solving Mendel's Laws of inheritance.
5. Numerical problems solving interaction of genes.
6. Floral biology of Rice, Maize, Pigeon pea, cotton.
7. Hybridization techniques - emasculation, bagging (for demonstration only).
8. Field visit to a plant breeding research station

BOT-128
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM
II B.Sc., Botany Practical examinations at the end of IV Semester
(Cell Biology, Genetics and Plant breeding)
Botany Practical Paper - V model (w.e.f.2020-21)

Time: 2 hours

Max. Marks: 50

1. Experiment 'A' Major experiment – Prepare a slide using squash technique and report any two important stages of mitosis in Onion root tips supplied to you.

12 M

Scheme of valuation: Preparation slide	4 M
Report of 2 stages of mitosis	2 M
Reasons and diagrams	6 M

2. Experiment 'B' – Solve the given Genetics problem and give the inference **10 M**

Scheme of valuation: Solving the problem	7 M
Inference	3 M

3. Scientific observation and data analysis **4 x 5 = 20 M**

- C. Microphotograph of a cell organelle
- D. Chromosome
- E. Floral biology
- F. Mutation breeding/Somaclonal variation/Molecular breeding technique

Scheme of valuation: Identification	1 M
Diagram	1 M
Reasons/analysis	3 M

4. Record, Viva-voce **5 + 3 = 08 M**