

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

I B.Sc., - Botany-1 / I Semester End (W.E.F. 2019-2020)

Microbial Diversity and Thallophyta**Total Hrs. of Teaching-Learning: 60 @ 4 h / Week****Total Credits : 03****Unit - 1 Origin of Life and Special Groups of Bacteria.****(12hrs)**

- a) Origin of life - Chemical Evolution
- b) Five Kingdom Concept of R.H. Whittaker.
- c) General Characteristics of Archaeobacteria, Mycoplasma, Chlamydia, Actinomycetes.
- d) Structure of Thallus and Cell in Cyanobacteria (Nostoc, Syntonema,) Economic importance of Cyanobacteria.

Unit - 2 Viruses**(12hrs)**

- a. Viruses - Introduction, Chemistry and Symmetry; structure of TMV and T4 Phage.
- b. Multiplication of Viruses - Lytic and Lysogenic Cycles
- c. Symptoms of Plant diseases caused by viruses; transmission of Viruses and control measures.
- d. Viral diseases: Tobacco mosaic, Bhendi vein clearing and Papaya leaf curl.

Unit - 3 Bacteria**(12hrs)**

- a. Bacteria - General characters, cell structure and nutrition
- b. Asexual and Sexual Reproduction in Bacteria
- c. Bacterial diseases in Plants(Paddy blast,Citrus canker)
- d. Economic importance of Bacteria

Unit - 4 Algae**(12hrs)**

- a. Algae : General characters (Pigments, reserve food material, flagella type),Thallus organization.
- b. Fritsch classification up to classes.
- c. Economic importance of Algae : Food, fodder and feed; phycocolloids,
- d. Systematic position, structure, reproduction and life history of following genera :
 - i. Chlorophyceae : *Chlamydomonas*
 - ii. Phaeophyceae : *Ectocarpus*
 - iii. Rhodophyceae : *Polysiphonia*

Unit - 5 Fungi & Lichens**(12hrs)**

- a. Fungi: General characters
- b. Ainsworth classification (outlines) and Systematic position, structure, reproduction and life history of following genera
 - i. Zygomycota : *Rhizopus*
 - ii. Ascomycota : *Penicillium*
 - iii. Basidiomycota : *Puccinia*
- c. Economic importance of Fungi - Beneficial and Harmful Effects.
- d. Lichens : Introduction, thallus structure and reproduction; ecological and economic importance.

Additional Inputs for CIA

1. Biogenesis, Germ Theory of Diseases,
2. Cultivation of *Spirulina*,
3. *Fritischiella*, *Vaucheria*
4. Major Famines of the World Due to Fungal Pathogens

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

Text Books for Botany -1

- A text book for BOTANY – I Semester : Telugu Akademi, Hyderabad

Suggested Readings for Botany -1

- **Pandey, B. P. (2001)** *College Botany, Vol. I: Algae, Fungi, Lichens, Bacteria, Viruses, Plant Pathology, Industrial Microbiology and Bryophyta*. S. Chand & Company Ltd, New Delhi.
- **Gangulee, H.R. & A.K. Kar (2010)** *College Botany (Vol.II)*. New Central Book agency (P),Ltd., Kolkata

Reference Books for Botany -1

- **Oladele Ogunseitan (2008)** *Microbial Diversity: Form and Function in Prokaryotes*, Wiley – Blackwell.
- **Pelczar, M.J. (2001)** *Microbiology, 5th edition*, Tata Mc Graw-Hill Co, New Delhi.
- **Presscott, L. Harley, J. and Klein, D. (2005)** *Microbiology, 6th edition*, Tata Mc Graw – Hill Co. New Delhi.
- **Fritsch F.E. (1935)** *The Structure & Reproduction of Algae*: Cambridge University Press Cambridge, U.K. Vol. I, Vol. II.
- **Bold, H.C. & M. J. Wynne (1984)** *Introduction to the Algae*, Prentice-Hall Inc., New Jersey
- **Robert Edward Lee (2008)** *Phycology*. Cambridge University Press, New York
- **Van Den Hoek, C., D. G. Mann & H. M. Jahns (1996)** *Algae : An Introduction to Phycology*. Cambridge University Press, 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

BOT -139
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

I B.Sc., Botany Practical Paper - I Practical Syllabus (w.e.f. 2019-20)
(Microbial Diversity and Thallophyta)

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

1. Knowledge of equipment used in Microbiology: Spirit lamp, Inoculation loop, Hot-air oven, Autoclave/Pressure cooker, laminar air flow chamber and Incubator.
2. Preparation of liquid and solid media for culturing of microbes (Demonstration).
3. Study of viruses and bacteria using electron photo micrographs (TMV, Bacteriophage, HIV, Cocci, Bacillus, Spirillum bacteria)
4. Gram staining technique (Demonstration).
5. Study of Plant disease symptoms caused by Bacteria (Citrus canker, leaf blight of rice, Angular leaf spot of Cotton).
6. Study of Plant disease symptoms caused by viruses (TMV, Bendi vein clearing and Leaf curl of Papaya),
7. Study of Plant disease symptoms caused by Fungi (Late blight of potato, Red rot of Sugarcane and Paddy blast).
8. Study of vegetative and reproductive structures of the following:
 - a) Cyanobacteria : *Nostoc and Scytonema*.
 - b) Algae : *Chlamydomonas, Ectocarpus, Polysiphonia,*
 - c) Fungi : *Rhizopus, Penicillium and Puccinia* .
1. Study of plant material infected by Fungi
 - i. Rot of tomatoes
 - ii. Blue and green molds of Citrus fruits
 - iii. wheat rust (Section cutting of diseased parts of Wheat and Barberry for identification of different spores).
2. Lichens: Morphology (Crustose, foliose and fruticose lichens) and of anatomy of different thalli.
11. Field Visit.

BOT-120
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY
I B.Sc., - Botany-2/ II Semester End (w.e.f. 2018-19)
Diversity of Archegoniate and Plant Anatomy
Total Hrs. of Teaching-Learning: 60 @ 4h / Week Total Credits: 03

Unit - 1 Bryophyta

(12h)

- a. Introduction, general characters, classification up to classes.
- b. Systematic position, Structure, reproduction and life history of following genera (Developmental stages are not required):
 - i. Hepaticopsida : *Marchantia*
 - ii. Bryopsida : *Funaria*
- c. Evolution of Gametophyte in Bryophytes.
- d. Evolution of Sporophyte in Bryophytes.

Unit - 2 Pteridophyta

(12h)

- a. Introduction, general characters, classification up to classes.
- b. Systematic position, structure, reproduction and life history of following genera (Developmental stages are not required):
 - i. Lycopsidea : *Lycopodium*
 - ii. Pteropsida : *Marsilea*
- c. Stellar evolution in Pteridophytes
- d. Heterospory and Seed habit in Pteridophytes.

Unit - 3 Gymnosperms

(12h)

- a. Introduction, general characters and classification up to classes.
- b. Systematic position, structure, reproduction and life history of following genera (Developmental stages are not required):
 - i. Coniferopsida : *Pinus*
 - ii. Gnetopsida : *Gnetum*
- c. Economic importance of Gymnosperms
- d. Endangered Gymnosperms

Unit - 4 Tissues and Tissue systems

(12h)

- a. Meristems : Introduction, characteristics and classification.
- b. Root Apical Meristem and theories on its histological organization.
- c. Shoot Apical Meristem and theories on its histological organization.
- d. Tissues: Introduction, Simple, Complex and Special.

Unit - 5 Secondary growth in stem and wood structure

(12h)

- a. Anomalous secondary growth in Stem (*Boerhaavia*, *Achyranthus* and *Dracaena*) and Root (*Beta*)
- b. Botanical name, family, general characters of the wood and identification characters of : *Tectona grandis* (Teak), *Dalbergia latifolia* (Rose wood), *Pterocarpus santalinus*, (Red sanders), *Terminalia arjuna* (Tella maddi) and *Azadirachta indica* (Neem).

Text Books for Botany - 2

- A text book for BOTANY – II Semester : Telugu Akademi, Hyderabad

Suggested Readings for Botany - 2

- **Pandey, B. P. (2006)** *College Botany, Vol. II: Pteridophyta, Gymnosperms and Paleobotany.* S. Chand & Company Ltd, New Delhi.
- **Gangulee, H.R. & A.K. Kar (2010)** *College Botany (Vol.II).* New Central Book agency (P),Ltd., Kolkata

Reference Books for Botany - 2

- **Shaw, A. J. & B. Goffinet (2000)** *Bryophyte Biology.* Cambridge University Press, New York
- **O. P. Sharma (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)* Springe-Verlag, New York
- **Bhatnagar, S.P. & Alok Moitra (1996)** *Gymnosperms.* New Age International, New Delhi
- **Smith, G.M. (1971):** *Cryptogamic Botany Vol. II.* - Tata Mc Graw Hill
- **Sporne, K.R. (1971)** *The Morphology of Gymnosperms.* Hutchinsons Co. Ltd., London
- **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
- **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.

GOVERNMENT COLLEGE (AUTONOMOUS),RAJAHMUNDRY

**I B.Sc., Botany Practical Paper - II Practical Syllabus (w.e.f. 2018-19)
(Diversity of Archegoniate and Plant anatomy)**

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

1. Morphology (vegetative and reproductive structures), anatomy of the following :
 - a. Bryophytes : *Marchantia* and *Funaria*
 - b. Pteridophytes : *Lycopodium* and *Marselia*
 - c. Gymnosperms : *Pinus* and *Gnetum*
2. Demonstration of double staining technique and preparation of slides with that technique.
3. Tissue organization in root and shoot apices using permanent slides
4. Simple tissues : Parenchyma, Collenchyma and Sclerenchyma
5. Study of different types of stomata using epidermal peels
6. Anomalous secondary growth (Section cutting) in the following plants :
 - a. *Achyranthes*
 - b. *Boerhavia*
 - c. *Dracaena*
7. Study of xylem elements in Teak and Neem woods using maceration technique.
8. Anatomical study of wood (Teak and Neem) in T.S., T.L.S. and R.L.S.
9. Botanical field visits / visit to local timber depots.

BOT -106

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

II B.Sc., - Botany - 3 / III Semester End (W.E.F. 2018-19)

Plant Taxonomy and Embryology

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

Total Credits : 03

Unit -1 Introduction to Plant Taxonomy

(12 h)

- a. Fundamental components of taxonomy (identification, nomenclature, classification)
- b. Taxonomic resources: Herbarium, Herbaria of National and International importance.
- c. Botanical Nomenclature - Principles and rules of ICBN (ranks and names; principle of priority, binomial system; type method, author citation, valid-publication).

Unit - 2 Classification

(12 h)

- a) Types of classification- Artificial, Natural and Phylogenetic.
- b) Bentham & Hooker's system of classification- merits and demerits.
- c) Hutchinson system of classification- merits and demerits
- d) Phylogeny, Origin and Evolution of Angiosperms; Angiospermic Phylogenetic Group - (APG IV - 2016 Classification)

Unit - 3 Systematic Taxonomy - I

(12 h)

Systematic study and economic importance of plants belong to the following families:

Polypetalous : Annonaceae, Brassicaceae, Rutaceae, Cucurbitaceae and Apiaceae.

Unit - 4 Systematic Taxonomy - II

(12 h)

Systematic study and Economic importance of plants belong to the following families:

Gamopetalous : Asteraceae, Asclepiadaceae and Lamiaceae

Monochlamydeous : Euphorbiaceae

Monocotyledonous : Poaceae

Unit - 5 Embryology

(12 h)

- a. Anther structure, microsporogenesis and development of male gametophyte.
- b. Ovule structure and types.
- c. Megasporogenesis; development of Monosporic (*Polygonum*, *Oenothera*), Bisporic (*Allium*, *Endymion*) and Tetrasporic (*Peperomia*, *Drusa* and *Adoxa* types).
- d. Pollination and Fertilization (out lines) Endosperm development and types.
- e. Development of Dicot and Monocot embryos, Polyembryony.

Additional Inputs For CIA:

1. Botanical gardens, Floras, Single and Multiple Access Keys,
2. Areceae, Orchidaceae.
3. Apomixis

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

Text Books for Botany - 3

- A text book for BOTANY – III Semester : Telugu Akademi, Hyderabad

Suggested Readings for Botany - 3

- **Pandey, A. K. (2000)** *Introduction to Embryology of Angiosperms*. CBS Publishers & Distributors Pvt. Ltd. , New Delhi
- **Sambamurty, A.V.S.S. (2005)** *Taxonomy of Angiosperms* I. K .International Pvt. Ltd., New Delhi
- **S.K.Mukharjee (2012)** *College Botany Volume-III (Angiosperms, Families of Angiosperms Phytogeography and Tissue Culture)* New Central Book Agency (P) Ltd., London

Reference books for Botany - 3

- **Jeffrey, C. (1982)** *An Introduction to Plant Taxonomy*. Cambridge University Press, Cambridge. London.
- **Lawrence, George H.M. (1951)** *Taxonomy of Vascular Plants*. The McMillan Co., New York
- **Mathur, R.C. (1970):** *Systematic Botany (Angiosperms)* Agra Book Stores – Lucknow, Ajmer, Allahabad, Delhi.
- **Heywood, V. H. and D. M. Moore (1984)** *Current Concepts in Plant Taxonomy*. Academic Press, London.
- **Bhojwani, S. S. and S. P. Bhatnagar (2000)** *The Embryology of Angiosperms (4th Ed.)*, Vikas Publishing House, 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

BOT - 106
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

II B.Sc., Botany Practical Paper - III Practical Syllabus (w.e.f. 2018-19)
(Plant Taxonomy and Embryology)

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

1. Systematic study of locally available plants belonging to the families prescribed in theory syllabus.
2. Preparation of taxonomic key for *Cleome*, *Sida*, *Crotalaria* species
3. Demonstration of herbarium techniques.
4. Structure of pollen grains using whole mounts (*Catharanthus*, *Hibiscus*, *Acacia*, Grass).
5. Demonstration of Pollen viability test using *in-vitro* germination (*Catharanthus*).
6. Study of ovule types and developmental stages of embryo sac using permanent slides /Photographs.
7. Structure of endosperm (nuclear and cellular)
8. Developmental stages of dicot and monocot embryos using permanent slides / Photographs
8. Isolation and mounting of embryo (using *Symopsis* / *Senna* / *Crotalaria*)
9. Field visits. study of local flora and submission of Field Note Book.

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)**

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

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

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

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

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

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

- a. Respiration: Aerobic and Anaerobic processes; Glycolysis, Krebs cycle.
- b. Electron Transport System, mechanism of oxidative phosphorylation,
- c. Lipid metabolism : Introduction, classification of lipids .

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

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

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 Physiolog*, 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 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-127

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

III B.Sc., - Botany -5 / V 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

Unit - 1 Cell Biology (12 h)

- a) Cell, the unit of life- Cell theory, Prokaryotic and eukaryotic cells.
- b) Eukaryotic cell components, Ultra structure and functions of cell wall & cell membrane
- c) Chromosomes: morphology of prokaryotic and eukaryotic chromosome.
- d) Organization of DNA in a chromosome (nucleosome model), Euchromatin and heterochromatin.

Unit - 2 Genetic material (12 h)

- a) DNA structure (Watson & Crick model)
- b) Replication of DNA (semi-conservative method)
- c) Types of RNA (mRNA, tRNA, rRNA), their structure and functions.
- d) Genetic code, Gene regulation – *Lac* operon

Unit - 3 Inheritance (12 h)

- a) Mendel's laws of Inheritance (Mono- and Di- hybrid crosses); backcross and test cross.
- b) Interaction of genes –Typical dihybrid, complementary, epistasis (dominant and recessive), inhibitory, duplicate Gene Interactions.
- c) Linkage: Introduction, complete and incomplete linkage and Significance.
- d) Crossing over: Introduction, types and Mechanism

Unit - 4 Plant breeding (12 h)

- a. Introduction and Objectives of plant breeding.
- b. Methods of crop improvement: Procedure, advantages and limitations of (i) Introduction, (ii) Selection – Mass, Pureline and Clonal (iii) Hybridization.

Unit - 5 Breeding, and Crop improvement (12 h)

- a. Role of mutations in crop improvement.
- b. Role of somaclonal variations in crop improvement.
- c. Molecular breeding – use of DNA markers in plant breeding and crop improvement (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)

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

Text Books for Botany - 5

- A text book for BOTANY – V Semester : Telugu Akademi, Hyderabad

Suggested readings for Botany - 5

- **S. S. Purohit (2010)** B.Sc., *Unified Botany Volume –III, Cell Biology (Genetics, Ecology and Biodiversity)*, SaraswatiPurohit for Student Edition, Jodhpur
- **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
- **R. C. Chaudhary (1996)** *Introduction to Plant Breeding*, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi
- **B. D. Singh (1999)** *Plant Breeding*, Kalyani publishers, Ludhiana

Reference books for Botany - 5

- **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 Mc Graw –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
- **B.D.Singh (2001)** *Plant Breeding : Principles and Methods*, Kalyani Publishers, Ludhiana
- **Mandal, A.K., P.K.Ganguli and S.P. Banerjee (1991)** *Advances in Plant Breeding, Volumes I & II*, CBS Publishers & Distributors, New Delhi (India)
- **Bahar A. Siddiqui & S. Khan (1997)** *Plant Breeding & In Vitro culture*, CBS Publishers & Distributors, New Delhi (India)
- **S.K. Gupta (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-127
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

III B.Sc., Botany Practical Paper - V Practical Syllabus (w.e.f. 2018-19)
(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

III B.Sc., - Botany -6/ V Semester End (W.E.F. 2018-19)

Plant Ecology and Phytogeography

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

Total Credits : 03

Unit – 1] Elements of Ecology

(12 h)

- a. Ecology: Introduction, Scope, Importance.
- b. Light Factors.
- c. Temperature Factors.
- d. Edaphic Factor: Origin, formation, composition and soil profile.
- e. Biotic Factor: Interactions between plants and animals.

Unit – 2] Ecosystem

(12 h)

- a. Ecosystem: Concept and components, energy flow, Food chain, Food web.
- b. Ecological pyramids.
- c. Biogeochemical cycles- Carbon, Nitrogen and Phosphorous.
- d. Productivity of ecosystem-Primary, Secondary and Net productivity.

Unit – 3] Population and Community Ecology

(12 h)

- a. Population Ecology, Introduction, characteristics and importance.
- b. Ecads and Ecotypes (Outline)
- c. Plant communities- characters of a community, Frequency, density, cover, life forms(Raunkiaer Classification), competition.
- d. Interaction between plants growing in a community.

Unit – 4] Phytogeography

(12 h)

- a. Principles of Phytogeography, Distribution (wides, endemic, discontinuous species).
- b. Phytogeographic regions of India
- c. Phytogeographic regions of World
- d. Endemism – Introduction, types and causes, Endemic Species and Their Conservation.(out Lines)

Unit – 5] Plant Biodiversity

(12 h)

- a. Biodiversity – Introduction, Earth summit, Levels of biodiversity - genetic, species and Ecosystem.
- b. Biodiversity hotspots of India.
- c. Loss of biodiversity – causes and conservation (*In-situ* and *ex-situ* methods).
- d. Role of UNDP, UNEP, NBA

Additional Inputs :

1. Endemic Gymnosperms and Angiosperms of India
2. Cartagena and Nagoya Protocols
3. Seed banks - conservation of genetic resources and their importance.

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

Text Books for Botany - 6

- A text book for BOTANY – V Semester : Telugu Akademi, Hyderabad

Suggested readings for Botany - 6

- **N.S.Subrahmanyam & A.V.S.S. Sambamurty (2008)** *Ecology* Narosa Publishing House, New Delhi
- **P.D.Sharma (2012)** *Ecology and Environment*, Rastogi Publications, New Delhi
- **A. K. Agrawal & P.P. Deo (2010)** *Plant Ecology*, Agrobios (India), Jodhpur
- **U. Kumar (2007)** *Biodiversity : Principles & Conservation*, Agrobios (India), Jodhpur

Reference books for Botany - 6

- **Edward J. Kormondy (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
- **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

BOT – 128

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

III B.Sc., Botany Practical Paper - VI Practical Syllabus (w.e.f. 2018-19)

(Plant Ecology and Phytogeography)

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. Field trip to a place of ecological importance or Biodiversity significance,

BOT -122
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY
III B.SC -BOTANY/VI SEMESTER (w.e.f. 2018-19)
PAPER-VII (A) Organic farming and sustainable agriculture
Total Teaching Hours 60 Hrs @4hrs/Week **Credits: 03**

- Unit-I: Concept of Organic Farming:** **12Hrs**
1. Introduction: farming, organic farming, concept and development of organic farming, principles of organic farming, types of organic farming biodynamic farming.
 2. Benefits of organic farming ,need for organic farming ,conventional v/s Organic farming
 3. Scope of Organic farming; Andhra Pradesh and National and international status
 4. Agencies and institutions organic agriculture.
- Unit -II: Organic plant nutrient management:** **12Hrs**
1. Organic farming systems, soil tillage, land preparation and mulching.
 2. Propagation –seed, planting, propagation materials and seed treatments, water management.
 3. Green manuring, composting- principles, stages, types and factors, composting methods, vermicomposting.
 4. Bio fertilizers: Introduction, Azolla, Symbiotic Bacteria and Mycorrhiza
- Unit - III: Organic plant protection** **12Hrs**
1. Plant protection- Plant Pathology and Bio-Pesticide applications - Rice, Bajra, Red gram, Papaya and lemon.
 2. Weed management.
 3. Policies and intensives of organic production.
 4. Farm inspection and certification.
- Unit - IV: Sustainable agriculture:** **12Hrs**
1. Organic crop production methods- Rice.
 2. Organic crop production methods – Bajra
 3. Organic crop production methods – Red gram
 4. Livestock component in organic farming.
- Unit - V: Sustainable agriculture:** **12Hrs**
1. Farm economy: basic concepts – demand and supply, economic viability of a farm.
 2. Basic production principles, reducing expenses, ways to increase returns ,cost of production system, benefits/cost ratio, marketing, imports and exports,
 3. Terrace farming
 4. Mushroom Cultivation.

Books for Reference:

1. Palaniappan SP & Anandurai K. 1999. Organic Farming–Theory and Practice. Scientific Publishers, Jodhpur.
2. Joshi, M. 2014. New Vistas of Organic Farming 2nd Ed. Scientific Publishers, Jodhpur.
3. Farming system : Theory and Practice - S.A.Solaimalai
4. Organic Farming: Theory and Practice- S.P.Palaniappan and K.A. Annadurai
5. A hand book of Organic Farming by A.K.Sharma

Suggested Activities:

Preparation of Vermicompost in small scale, observing sewage sludge disposal mechanisms in urban/semi urban areas, studying the usage, of green manures, neem oil, neem cake, pongamia oil in organic farming, livestock component in various farming methods, visiting an Apiculture center, drawing various terrace farming models



BOT -122
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY
III B.Sc., Botany Practical Paper - +VII-A Practical Syllabus (w.e.f. 2018-19)
(Organic Farming and Sustainable Agriculture)

Total hours of laboratory Exercises 30hrs @ 2 per week **Credits : 02**

1. Study of different bio pesticides, weedicides, inorganic and organic fertilizers
2. Deficiency symptoms of nutrient deficiency symptoms (photographs)
3. Soil testing, liming, and fertilizing
4. Preparation of enriched Farm Yard Manure.
5. Study of composting methods.
6. Preparation of Vermi-compost.
7. Study of recycling of farm waste.
8. Study of methods of green Manuring.
9. Study of steps in Mushroom cultivation
10. Visit to urban waste recycling unit.
11. Study project report under supervision of lecturer - farm manure preparation/Vermi-compost/waste management/green manures/mushroom cultivation/nutrient requirements of vegetables

Expected domain skills to be achieved:

Performing Soil analysis, soil enrichment methods, composting procedure, recycling of wastes, use of waste materials in mushroom cultivation, understanding nutrient requirement of various crops, identifying various methods of keeping soil health

BOT - 130
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY
III B.SC -BOTANY/ VI SEMESTER (w.e.f. 2018-19)
Paper VII-(B): Nursery, Gardening and Floriculture.

Total Teaching Hours 60 Hrs @4hrs/Week

Credits : 03

Unit I: Nursery:

(12 hrs.)

1. Definition, objectives, scope and building up of infrastructure for nursery.
2. Planning and seasonal activities - Planting - direct seeding and transplants.
3. Nursery Management and Routine Garden Operations.

Unit II: Gardening

(12 hrs.)

1. Definition, Objectives and Scope - Different Types of Gardening.
2. Landscape and Home Gardening - Parks and its Components, Plant Materials and Design.
3. Computer Applications in Landscaping.
4. Gardening Operations: Soil Laying, Manuring, and Watering.
5. Landscaping Places of Public Importance: Landscaping Highways and Educational Institutions)
6. Some Famous Gardens of India.

Unit III: Propagation methods

(12 hrs.)

1. Sowing/raising of seeds and seedlings, transplanting of seedlings.
2. Air-layering, cutting, selection of cutting, propagule collecting season, treatment of cutting rooting medium and planting of cuttings - Hardening of plants.
3. Propagation of ornamental plants by rhizomes, corms tubers, bulbs and bulbils.
4. Green house - mist chamber, shed root, shade house and glass house for propagation.

Unit IV: Floriculture

(12 hrs.)

1. Ornamental Plants Ornamental Plants: Flowering annuals; herbaceous, perennials; Shade and ornamental trees.
2. Ornamental bulbous and foliage plants; Cacti and succulents.
3. Ornamentals-palms.
4. Cultivation of plants in pots, indoor Gardening, Bonsai

Unit V: Commercial Floriculture

(12 hrs.)

1. Factors affecting flower production; Production and packaging of cut flowers; Flower arrangements; Methods to prolong vase life of flowers
2. Cultivation of Important cut flowers (Aster, Dahlia, Gerbera, Anthuriums, Marigold, Rose, Liliium)
3. Management of pests, diseases and harvesting.
4. Methods of harvesting.

Books for Reference:

1. Bose T.K. & Mukherjee, D., 1972, Gardening in India, Oxford & IBH Publishing Co., New Delhi.
2. Sandhu, M.K., 1989, Plant Propagation, Wile Eastern Ltd., Bangalore, Madras.
3. Kumar, N., 1997, Introduction to Horticulture, Rajalakshmi Publications, Nagercoil. (institution)
4. Randhawa, G.S. and Mukhopadhyay, A. 1986. Floriculture in India. Allied Publishers.

Suggested Activities:

Raising a nursery, managing it, studying and drawing various landscaping designs, practicing layering methods, using shade nets to protect horticultural crops, practicing indoor gardening techniques, visiting florists and recording their methods of prolonging vase life of commercial cut flowers.

BOT - 130
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY
III B. Sc - BOTANY SYLLABUS
SEMESTER- VI (Elective) Practical Syllabus, (w.e.f. 2018-19)

Paper VII-(B): Nursery, Gardening and Floriculture

Total hours of teaching 30hrs **2hrs per week**

1. Tools, implements and containers used for propagation and nursery techniques.
2. Propagation by cutting, layering, budding and grafting
3. Seed propagation- preparation of portable trays, seed treatments, sowing and seedling production.
4. Identification and description of annuals, herbaceous perennials, climbers, creepers, foliage and flowering shrubs, trees, palms, ferns, ornamental grasses; cacti and succulents..
5. Planning and designing of gardens, functional uses of plants in the landscape
6. Preparation of land for lawn and planting.
7. Identification of commercially important flower crops and their varieties.
8. Propagation practices in flower crops, sowing of seeds and raising of seedlings of annuals.
9. Use of chemicals and other compounds for prolonging the vase life of cut flowers.
10. Grading, packing and marketing of cut flowers.
11. Visit to commercial nurseries and commercial tissue culture laboratory
12. Study project under supervision of lecturer – nursery/ornamental flowers/ plants/lawn designing/landscape designing

Expected domain skills to be achieved: Ability to use a variety of garden tools and implements, proficiency in layering and grafting techniques (cleft grafting and bud grafting), landscape drawings using computers, raising of healthy nurseries of flowering plants, managing vase life of cut flowers etc.

BOT-143

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY

III B.Sc., - Botany-VII C / VI Semester End (w.e.f. 2018-19)

Economic Botany

Total Hrs. of Teaching-Learning: 60 @ 3h/Week

Total Credits: 03

Unit - I Economic Botany - 1

(12h)

1. Introduction and Scope.
2. Concept of centres of origin, their importance with reference to Vavilov's work
3. Morphology and Nutritive values of following crops.
 - a) **Cereals** : Rice and Wheat
 - b) **Millets** : Jowar and Bajra

Unit - II Economic Botany - 2

(12h)

1. Botanical name, family, part used, morphology and economic importance of the following.
 - a) **Legumes** : Red gram and Black gram
 - b) **Spices** : Cloves and Cardamom
 - c) **Oils** : Sun Flower and Palm Oil
 - d) **Beverages** : Tea and Coffee

Unit - III Economic Botany - 3

(12h)

1. Botanical name, family, part used, morphology and economic importance of the following
 - a) **Medicinal** : *Atropa belladonna* and *Azadirachta indica*
 - b) **Biopesticides** : *Lawsonia inermis* and *Curcuma langa*

Unit - IV Economic Botany - 4

(12h)

1. Botanical name, family, part used, morphology and economic importance of the following.
 - a) **Fiber Yielding Plants** : Cotton and Jute
 - b) **Latex Yielding Plants** : *Hevea brasiliensis* and *Parthenium hysterophorus*

Unit - V Economic Botany - 5

(12h)

1. Botanical name, family, part used, morphology and economic importance of the following
 - a) **Fruit yielding plants** : Banana and Sapota
 - b) **Vegetable Yielding Plants** : Brinjal and Cauli flower

Suggested Readings:

1. Kochhar, S.L. (2011). Economic Botany in the Tropics, MacMillan Publishers India Ltd., New Delhi. 4th edition.
2. Bhojwani, S.S. and Razdan, M.K., (1996). Plant Tissue Culture: Theory and Practice. Elsevier Science Amsterdam. The Netherlands.
3. Glick, B.R., Pasternak, J.J. (2003). Molecular Biotechnology- Principles and Applications of recombinant DNA. ASM Press, Washington.

BOT-143
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY
I B.Sc., - Botany-VII C / VI Semester End (w.e.f. 2018-19)
Economic Botany Practical Syllabus

Total Hrs. of Teaching-Learning: 60 @ 3h / Week **Total Credits: 03**

1. Study of economically important plants :
 - a) Wheat,
 - b) Rice,
 - c) Jowar
 - d) Bazra
 - e) Red Gram,
 - f) Black gram,
 - g) Cloves
 - h) Cardamom
 - i) Sun Flower
 - j) Palm Oil
 - k) Tea
 - l) Coffee
 - m) *Atropa belladonna*
 - n) *Azadirchta indica*
 - o) *Lawsonia inermis*
 - p) *Curcuma langa*
 - q) Cotton
 - r) Jute
 - s) *Hevea brasiliensis*
 - t) *Parthenium hysterophorus*
 - u) Banana
 - v) Sapota
 - w) Brinjal
 - x) Cauli flower

2. Sections and micro chemical tests
3. Preparation of Seed Bank
4. Visit to Tea / Rice / Oil Processing units / Biotechnology Lab / Tissue Culture lab.
5. Field Visit to collect different economically plants.

BOT - 135
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY
III B.SC -BOTANY/VI SEMESTER (W.E.F-2018-2019)
Paper VIII-(A1): Plant tissue culture and its Biotechnological applications

Total Teaching Hours 60 Hrs @4hrs/Week

Credits: 03

Unit I: PLANT TISSUE CULTURE - 1

(12hrs)

1. History of plant tissue culture research - basic principles of plant tissue culture, meristem culture, organ culture, Totipotency of cells, differentiation and dedifferentiation.
2. Methodology - sterilization (physical and chemical methods), culture media, Murashige and Skoog's (MS medium), phytohormones, medium for micro-propagation/clonal propagation of ornamental and horticulturally important plants.
3. Callus subculture maintenance, growth measurements, morphogenesis in callus culture - organogenesis, somatic embryogenesis.

UNIT-II: Plant Tissue culture -2

(12hrs)

1. Endosperm culture - Embryo culture -culture requirements - applications, embryo rescue technique.
2. Production of secondary metabolites.
3. Cryopreservation; Germplasm conservation.

Unit III: Recombinant DNA technology

(12hrs)

1. Restriction Endonucleases (history, types I-IV, biological role and application); concepts of restriction mapping.
2. Cloning Vectors: Prokaryotic (pUC 18, pBR322, Ti plasmid and Lambda phage, Eukaryotic Vectors (YAC and briefly PAC)
3. Gene cloning (Bacterial Transformation and selection of recombinant clones, PCR mediated gene cloning)
4. Construction of genomic and cDNA libraries, screening DNA libraries to obtain gene of interest by complementation technique, colony hybridization.

Unit IV: Methods of gene transfer

(12hrs)

1. *Methods of gene transfer - agrobacterium - mediated, direct gene transfer by electroporation, microinjection, micro projectile bombardment.*
2. *Selection of transgenics - selectable marker and reporter genes (Luciferase, GUS, GFP)*

Unit V: Applications of Biotechnology

(12 hrs)

1. *Applications of plant genetic engineering - crop improvement herbicide resistance, insect resistance, Virus resistance*
2. Genetic modification - transgenic plants for pest resistant (Bt-cotton); herbicide resistance (Round Up Ready soybean); improved agronomic traits - flavr Savr tomato, Golden rice); Improved horticultural varieties Moon dust carnations).

Books for Reference:

1. Pullaiah. T. and M.V.Subba Rao. 2009. Plant Tissue culture. Scientific Publishers, New Delhi.
2. Bhojwani, S.S. and Razdan, M.K., (1996). Plant Tissue Culture: Theory and Practice. Elsevier Science Amsterdam. The Netherlands.
3. Glick, B.R., Pasternak, J.J. (2003). Molecular Biotechnology- Principles and Applications of recombinant DNA. ASM Press, Washington.
4. Bhojwani, S.S. and Bhatnagar, S.P. (2011). The Embryology of Angiosperms. Vikas Publication House Pvt. Ltd., New Delhi. 5th edition.
5. Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics. John Wiley and Sons, U.K. 5th edition
6. Stewart, C.N. Jr. (2008). Plant Biotechnology & Genetics: Principles, Techniques and Applications John Wiley & Sons Inc. U.S.A.

Suggested Activities:

In vitro initiation of callus on artificial medium, seminars on utilization of rDNA technology, debates on applications of Biotechnology (whether it is a boon or bane to the society) studying growth patterns, vegetative characteristics of Bt.cotton and identifying the features of its pest resistance

BOT - 135
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY
IIIB.SC -BOTANY/VI SEMESTER (w.e.f-2018-2019)
Elective Practical Paper VIII-(A1): Plant tissue culture and its
biotechnological applications

Total hours of teaching 30hrs

2hrs per week

1. (a) Preparation of MS medium.
(b) Demonstration of in vitro sterilization methods and inoculation methods using leaf and nodal explants of Tobacco/Datura/ Brassica etc.
2. Study of embryo and culture, micro propagation of Banana, somatic embryogenesis, artificial seeds through photographs.
3. Construction of restriction map of circular and linear DNA from the data provided.
4. Study of methods of gene transfer through photographs: Agrobacterium-mediated, direct gene transfer by electroporation, microinjection, and micro projectile bombardment.
5. Different steps involved in genetic engineering for production of Bt. cotton, Golden rice, Flavr Savr tomato through photographs.
6. Isolation of plasmid DNA
7. Restriction digestion and gel electrophoresis of plasmid DNA (optional)
8. Field visit to a lab involved in tissue culture
9. Study project under supervision of lecturer - tissue culture/ genetic engineering

Expected domain skills to be achieved:

Ability to prepare artificial nutrient media, preparing independently, applying various sterilization procedures for media, glassware and biological materials, in vitro propagation of Banana callus, morphogenesis--s, clonal propagation methods, isolation of plasmid DNA individually and as a group.

BOT - 123
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY
III B.Sc., - Botany - 8 A2/ VI Semester End (w.e.f2018-19)
Ethanobotany and medicinal botany
Total Teaching Hours 60 Hrs @3 Hrs / Week **Credits: 03**

Unit - I : Ethnobotany : **12hrs**

1. Introduction, concept, scope, and objectives: ethnobotany as an interdisciplinary science the relevance of ethnobotany in the present context.
2. Major and minor ethnic groups or tribal of india, and their life styles.
3. Plants used by the tribal populations: a) food plants, b) intoxicants and beverages, c) resins, oils and miscellaneous uses.

Unit - II : Role of ethnobotany in modern medicine : **12 hrs**

1. Role of ethnobotany modern medicine with special examples *Rauwolfia serpentina*, *Trichopus zeylanicus*, *Artemisia annua*, *Withania somnifera*.
2. Medico- ethnobotanical sources in India.
3. Significance of the following plants in ethnobotanical practices. (along with their habitat and morphology) a) *Azadiracta indica*, b) *Ocimum sanctum*, c) *Vitex negundo*, d) *Glorisa superba*, e) *Tribulus terrestris*, f) *Phyllanthus niruri*, g) *Cassia auriculata*, h) *Indigofera tinctoria*, i) *Senna auriculata* j) *Curcuma longa*
4. Role of ethnic groups in the conservation of plant genetic resources.

Unit - III : Ethanobotany as a tool to protect Interests of ethnic groups **12hrs**

1. Sharing of wealth concept with few examples from india.
2. Biopiracy, intellectual property right and traditional knowledge.

Unit - IV: history and scope and importance medicinal plants Indigenous medicinal sciences: 12hrs

1. Definition and scope - **Ayurveda**: History, origin, panmchamahabuthas, saptadhatu and tridosha concepts, rasayana. Plants using ayurvedic treatments.
2. **Siddha**: origin of siddha medicinal systems, basis of siddha systems plants used in siddha medicine.
3. **Unani** : History, concept Unmoor - e - tibia tumours treatment/therapy, poly herbal formulations (in brief)

Unit - V : Conservation of endangered and endemic medicinal plants : **12hrs**

1. **Definition**: endemic and endangered medicinal plants.
2. Red list criteria.
3. In situ conservation: biosphere reservoirs, sacred groves, national parks.
4. Ex situ conservation : botanical gardens

Suggested Readings:

1. S.K. Jain, Manual of Ethnobotany, Scientific Publishers, Jodhpur, 1995.
2. Glimpses of Indian. Ethnobotny, Oxford and I B H, New Delhi - 1981.
3. S.K. Jain (ed.) 1989. Methods and approaches in ethnobotany. Society of ethnobotanists, Lucknow, India.
4. S.K. Jain, 1990. Contributions of Indian ethnobotny. Scientific publishers, Jodhpur.
5. Colton C.M. 1997. Ethnobotany - Principles and applications. John Wiley and sons - Chichester
6. Rama Ro, N and A.N. Henry (1996). The Ethnobotany of Eastern Ghats in Andhra Pradesh, India. Botanical Survey of India. Howrah.
7. Trivedi P C, 2006. Medicinal Plants: Ethnobotanical Approach, Agrobios, India.
8. Purohit and Vyas, 2008. Medicinal Plant Cultivation: A Scientific Approach, 2nd edn. Agrobios, India.
9. Pal, D.C. & Jain, S.K., 1998. Tribal Medicine. Naya Prakash Publishers, Calcutta
10. Raychudhuri, S.P., 1991. (Ed.) Recent advances in Medicinal aromatic and spice crops. Vol.1, Today & Tomorrow's printers and publishers, New Delhi

Suggested Activities:

Studying plant utilization methods by tribal/rural/migrant populations for their beverages, food, medicinal and uses, seminars on role of ethnic groups in conservation of plant genetic resources, project work on traditional knowledge about plant medicines, study of indigenous medicinal sciences and their efficacy.

BOT - 123

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY

III B.Sc., - Botany - 8 A2/ VI Semester End (w.e.f 2018-19)

Practical Syllabus : Ethanobotany and medicinal botany

TOTAL TEACHING HOURS 60 HRS @3 Hrs /WEEK

CREDITS: 03

1. Ethanobotanical specimens as prescribed in theory syllabus.
2. Detailed morphological and anatomical study of medicinally important part(s) of locally available plants (Minimum 8 plants) used in traditional medicine.
3. 3. Field visits to identify and collect ethno medicinal plants used by local tribes/folklore.

Domain skills expected to achieve: Identification of various plant parts used as medicines by ethnic groups, understanding the difference between ancient wisdom and modern system of medicine, traditional medicine at the rescue of curing drug resistant maladies like malaria and viral diseases, understanding the role of spices in Indian kitchens, their therapeutic role

BOT132
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY
III B.Sc., - Botany - VIII A3 / VI Semester End (w.e.f2018-19)
Seed Technology and Horticulture

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

Total Credits: 03

Unit -I : Basics of Seed Technology (12 h)

- a. Structure of Dicot and Monocot seeds; outgrowths of seeds.
- b. Seed dormancy and reasons for seed dormancy.
- c. Methods of breaking seed dormancy.
- d. Seed storage methods.

Unit -II : Seed Banks, testing & certification (12 h)

- a. Seed banks - necessity, working mode, types of seeds stored, seed banks around globe.
- b. Seed viability - measures of seed viability, factors affecting seed viability.
- c. Genetic erosion - introduction, causes, and examples in India and abroad; measures to check genetic erosion.
- d. Seed testing; seed certification.

Unit -III : Basics of Horticulture & Nursery (12 h)

- a. Horticulture - Introduction, branches of horticulture, scope and impact of horticulture.
- b. Definition, objectives, scope and building up of infrastructure for nursery.
- c. Planning and seasonal activities - Planting - direct seeding and transplants.
- d. Nursery Management and Routine Garden Operations.

Unit -IV : Propagation of Horticulture plants (12 h)

- a. Vegetative propagation of horticulture plants - Cuttings, grafting and layering. mist chamber.
- b. Ornamental plants - classification; Propagation of ornamental plants. By rhizomes, corms tubers, bulbs and bulbils.
- c. Bonsai - History, principles, creation, training, repotting, post-establishment care and common styles of bonsai.
- d. Protected structures for cultivation - Green house, poly house and shade net.

Unit -V: Floriculture & Landscaping (12 h)

- a. Floriculture - introduction; potential and trade in India; cultivation of *Chrysanthemum* and rose
- b. Landscaping - introduction, goals, categories, designing, elements; planning residential and non-residential land scapes; plant arrangement in land scape. Computer applications in landscaping.
- c. Some Famous gardens of India.

Suggested Readings

- **Joshi, A.K. & B. D. Singh (2005)** *Seed Science and Technology*, Kalyani publishers, Ludhiana
- **Dahiya, B.S. & K. N. Rai (1997)** *Seed Technology*, Kalyani publishers, Ludhiana
- **Rattan Lal Agrawal (1998)** *Seed Technology*, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
- **Agarwal, P.K. & M.Dadlani (1995)** *Techniques in Seed Science and Technology*, South Asian Publishers, New Delhi
- **S.S.Purohit (2010)** *B.Sc. Unified Botany Volume-IV* Saraswati Purohit for Student Edition, Jodhpur
- **V.L. Sheela (2011)** *Horticulture*, M.J.P. Publishers, Chennai
- **K.V.Peter (2015)** *Basics of Horticulture*, New India Publishing Agency, New Delhi
- **S. Prasad & U. Kumar (2012)** *Principles of Horticulture*, Agrobios (India), Jodhpur
- **S.N. Gupta & K.B. Naik (2010)** *Instant Horticulture*, Jain Brothers, New Delhi
- **Kumar Misra, K.K. & R. Kumar (2014)** *Fundamentals of Horticulture*, Biotech. Books, New Delhi

Reference Books

- **Nema, M.P.(1985)** *Principles of Seed Certification and Testing*, Allied Publisher Ltd., New
- **Millee B. Mc.Donald & Lawrence O. Copeland (1998)** *Seed Production Principles & Practices*, C.B.S. Publishers, Delhi
- **Gurder Singh & S.R. Asokan (1997)** *Management of Seed Production Activity*, Oxford & I.B.H. Publishers, Delhi
- **Dadheeh, P.K. (1996)** *Seed Programming Management Systems & Concepts*, Loksahitya Kendra, Jodhpur
- **Kelly, A.F. (1993)** *Seed Planning and Policy for Agricultural Production*, C.B.S. Publishers & Distributors, Delhi
- **George Acquaaah (2004)** *Horticulture : Principles and Practices*, PHI Pvt. Ltd., New Delhi
- **Hartmann, H.T., D.E. Kester, F.T. Davies, Jr., R.L. Geneve (2004)** *Plant Propagation : Principles and Practices*, PHI Pvt. Ltd., New Delhi
- **Chada, K.L. & B. Choudhury (1997)** *Ornamental Horticulture in India*, PID, ICAR, New Delhi
- **N. Manga Devi (2012)** *Bonsai – The Miniature Trees*, EMSCO Books, Hyderabad
- **S. Prasad, D. Singh & U. Kumar (2010)** *Commercial Floriculture*, Agrobios (India) Jodhpur

BOT132
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY

III B.Sc., Botany Practical Paper - VIII A3 Practical Syllabus (w.e.f. 2018-19)
(Seed Technology and Horticulture)

1. Structure of Dicot and Monocot seeds
2. Seed germination test
3. Testing of seed viability using 2, 3, 5-triphenyl tetrazolium chloride (TTC).
4. Study of non-dormant seed germination: Breaking of seed dormancy caused by hard seed coat using scarification technique.
5. Determination of seed purity.
6. Protocol for seed certification.
7. Study on tools/equipment used in horticulture: Rake, hoe, spade, trowel, digger, Pick-axe,
8. Propagation by cutting, layering, budding and grafting.
9. Identification and description of annuals, herbaceous perennials, climbers, creepers, foliage and flowering shrubs, trees.
10. Study of structures for protected cultivation of Horticulture crops - shade net, glass house
And mist chamber.
11. Identification of commercially important flower crops and their varieties.
12. Visit to seed producing firms and horticulture farms.

GOVERNMENT COLLEGE (AUTONOMOUS) RAJAMAHENDRAVARAM

III B.Sc. Botany Syllabus Semester - VI : Cluster Elective - II (B)

PAPER - VIII (B1) - BIOLOGICAL INSTRUMENTATION AND METHODOLOGY

Total Hours of Teaching 60 Hrs @ 3 Hrs per Week

Unit -I: Imaging and related techniques: *(12 Hrs)*

Principles of microscopy; Light microscopy; Fluorescence microscopy; Electron Microscopy
(a) Flow cytometry (b) Applications of fluorescence microscopy: Chromosome banding, FISH, chromosome painting; Transmission and Scanning electron microscopy – sample preparation for electron microscopy, cryofixation, negative staining, shadow casting, freeze fracture, freeze etching.

Unit- II: pH and Centrifugation: *(12 Hrs)*

pH meter: Principles and instrumentation, Centrifugation: Principles, types of centrifuges, types of rotors, differential and density gradient centrifugation, application. Sonication, Freeze drying.

Unit- III: Spectrophotometry: *(12 Hrs)*

Principle involved in Spectrophotometer; Spectrophotometric techniques, Instrumentation: ultraviolet and visible spectrophotometry (single and double beam, double wavelength spectrophotometers), Infrared spectrometers - Luminometry and densitometry – principles and their applications - Mass Spectroscopy- principles of analysis, application in Biology.

Unit- IV: Chromatography: *(12 Hrs)*

Chromatographic techniques: Principle and applications – Column - thin layer –paper, affinity and gas chromatography - Gel filtration - Ion exchange and High performance liquid chromatography techniques – Examples of application for each chromatographic system - Basic principles of electrophoresis.

Unit-V: Preparation of molar, molal and normal solutions, buffers, the art of scientific writing (12 Hrs)

Understanding the details on the label of reagent bottles. Molarity and normality of common acids and bases. Preparation of solutions. Dilutions. Percentage solutions. Molar, molal and normal solutions. Technique of handling micropipettes; Knowledge about common toxic chemicals and safety measures in their handling.

The art of scientific writing and presentation of scientific matter. Scientific writing and ethics. Writing references. Powerpoint presentation. Poster presentation.

Introduction to copyright-academic misconduct/plagiarism in scientific writing.

Suggested Readings:

1. Bajpai, P.K. 2006. Biological Instrumentation and methodology. S. Chand & Co. Ltd.
2. K. Wilson and J. Walker Eds. 2005. Biochemistry and Molecular Biology. Cambridge University Press.
3. K. Wilson andKHGoulding. 1986. Principles and techniques of Practical Biochemistry. (3 edn) Edward Arnold, London.
4. Dawson, C. (2002). Practical research methods.UBS Publishers, New Delhi.
5. Stapleton, P., Yondeowei, A., Mukanyange, J., Houten, H. (1995). Scientific writing for agricultural research scientists – a training reference manual.
6. West Africa Rice Development Association, Hong Kong.
8. Ruzin, S.E. (1999). Plant micro technique and microscopy. Oxford University Press, New York, U.S.A.
9. University Press, New York, U.S.A.

Suggested activities:

Preparing various laboratory reagents, operating laboratory instruments, noting instrument readings, calculating results accurately, Skills on writing scientific articles, presentation of scientific results through tables, graphs, poster presentations and practicing power point presentations.

BOT125
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM
III B.Sc., Botany Practical examinations at the end of VI Semester
(Biological instrumentation and Methodology)
Botany Practical Paper - VIII B1 (w.e.f. 2018-19)

Time: 3 hours

Max. Marks: 50

1. Microscopy - Light microscopy: principles, parts & function
2. Micrometry- principle and measurement of microscopic objects: Low power and high power
3. Camera Lucida drawing with magnification and scale
4. Principle and working of phase contrast microscope
5. Principle & operation of Centrifuge
6. A) Preparation of standard acid and alkali and their standardization.
B) Preparation of various solutions (normal, molar, and percent) and ppm/ppb by serial dilutions
7. Study of principle and working of pH meter and Measurement of pH of Milk, Pepsi, Lemon juice etc. using pH paper and pH meter
8. Study of principle of Chromatography and separation of amino acids mixture By ascending Paper Chromatography
9. Principle & operation of Colorimeter
10. Principle & operation of Spectrophotometer
11. Chromosome banding, FISH, chromosome painting
12. Principle and technique of TLC (demonstration)
13. TLC separation of Amino acids from purified samples and biological materials (demonstration)
14. PCR - The Polymerase Chain Reaction (protocol) -demonstration
15. Study visit to an institute /laboratory

Domain skills expected to achieve:

Skill in operating laboratory equipment, their upkeep, and adept at various biological techniques. Ability to prepare molar, molal, normal solutions and solutions of different dilutions. Interpreting scientific results, and ability to present results in a scientific way through graphs, photographs, poster presentations and power point presentations.

GOVERNMENT COLLEGE (AUTONOMOUS) RAJAMAHENDRAVARAM

III B.Sc. Botany Syllabus Semester - VI : Cluster Elective - II (B)

PAPER - VIII (B2) - MUSHROOM CULTURE AND TECHNOLOGY

Total Hours of Teaching 60 Hrs @ 3 Hrs per Week

Unit I: Introduction, history: (12 Hrs)

Introduction - history - scope of edible mushroom cultivation, Types of edible mushrooms available in India – *Volvariellavolvacea*, *Pleurotuscitrinopileatus*, *Agaricusbisporus*. Nutritional and medicinal value of edible mushrooms; Poisonous mushrooms.

UNIT II: Pure culture-spawn preparation: (12 Hrs)

Pure culture - preparation of medium (PDA and Oatmeal agar medium) sterilization - preparation of test tube slants to store mother culture – culturing of *Pleurotus* mycelium on Petriplates, preparation of mother spawn in saline bottle and polypropylene bag and their multiplication.

Unit III: Cultivation Technology: (12 Hrs)

Infrastructure: Substrates (locally available) Polythene bags, vessels, Inoculation hook, inoculation loop, low cost stove, sieves, culture rack, mushroom unit (Thatched house) water sprayer, tray, small polythene bag. Mushroom bed preparation - paddy straw, sugarcane trash, maize straw, banana leaves. Factors affecting the mushroom bed preparation - Low cost technology, composting technology in mushroom production.

Unit IV: Storage and nutrition : (12 Hrs)

Short-term storage (Refrigeration - up to 24 hours) Long term Storage (canning, pickles, papads), drying, storage in salt solutions. Nutrition - Proteins - amino acids, mineral elements nutrition - Carbohydrates, Crude fibre content – Vitamins.

Unit V: Food Preparation: (12 Hrs)

Types of foods prepared from mushrooms; soup, cutlet, omelette, samosa, pickles and curry. Research Centres - National level and Regional level. Cost benefit ratio - Marketing in India and abroad, Export Value.

Suggested Readings:

1. Marimuthu, T. Krishnamoorthy, A.S. Sivaprakasam, K. and Jayarajan. R (1991) Oyster Mushrooms, Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore.
2. Swaminathan, M. (1990) Food and Nutrition. Bappco, The Bangalore Printing and Publishing Co. Ltd., No. 88, Mysore Road, Bangalore - 560018.
3. Tewari, Pankaj Kapoor, S.C., (1988). Mushroom cultivation, Mittal Publications, Delhi.
4. Nita Bahl (1984-1988) Hand book of Mushrooms, II Edition, Vol. I & Vol. II.
5. Biswas, S., M. Datta and S.V. Ngachan. 2011. Mushrooms: A Manual For Cultivation. PHI learning private Ltd., New Delhi, India.
6. Chang, S. and P.G. Miles. 2004. Mushrooms: cultivation, nutritional value, medicinal effect, and environmental impact. CRC Press. USA.
7. Miles, P.G. and S. Chang. 1997. Mushroom Biology: Concise basics and current developments. World Scientific Publishing Co. Pte.Ltd. Singapore.

Suggested activities:

Growing spawn on laboratory prepared medium in petriplates and maintaining, preparing compost and compost beds, packing of beds, spawning, maintaining moisture, picking, blanching and packing. Collecting naturally growing mushrooms and identifying them properly, visits to mushroom houses.

BOT126
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY
III B.Sc., Botany Practical examinations at the end of VI Semester
(Mushroom Culture and Technology)
Botany Practical Paper - VIII B2 (w.e.f. 2018-19)

Time : 3 hours

Max.Marks: 60M

1. Identification of different edible and poisonous mushrooms.
2. Microscopic and anatomical observations of different mushroom species.
3. Pure culture - preparation of medium (PDA and Oatmeal agar medium) sterilization.
4. Isolation and preparation of spawn under controlled conditions (preparation of mother spawn in saline bottle and polypropylene bag and their multiplication).
5. Types of Compost preparation and sterilization.
6. Mushroom bed preparation - paddy straw, sugarcane trash, maize straw, banana leaves/waste.
7. Inoculation and spawning of compost.
6. Incubation and harvesting of mushrooms (collection, drying and preservation).
7. Diseases of mushrooms (photographs).
8. Post-harvest technology steps (photographs).
9. Study tour to mushroom cultivation farms
11. Project work – cultivation of paddy straw/ oyster/ white button mushrooms.

Domain skills expected to achieve:

Identification of different edible species, skill in media and substrate preparation, isolation of pure culture for spawn, compost preparation, and practices in growing methods of different cultivated mushrooms, Postharvest handling and packing

GOVERNMENT COLLEGE (AUTONOMOUS) RAJAMAHENDRAVARAM

III B.Sc. Botany Syllabus Semester - VI : Cluster Elective - II (B)

PAPER - VIII (B3)

Total Hours of Teaching 60 Hrs @ 3 Hrs per Week

Internship / Project Work preferably either in an Institute or Industry

BOT-136

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY

III B.Sc., – Botany – 8 C1 / VI Semester End (w.e.f 2018-19

III B.Sc.: BOTANY SYLLABUS SEMESTER- VI

Paper VIII-C-1 : PLANT DIVERSITY AND HUMAN WELFARE

Total hours of teaching 60hrs @ 3hrs per week

Credits : 03

Unit- I: Plant diversity and its scope:

(12hrs)

- i. Genetic diversity, Species diversity, Plant diversity at the ecosystem level, Agro biodiversity and cultivated plant taxa, wild taxa.
- ii. Values and uses of biodiversity: Ethical and aesthetic values, iii. Methodologies for valuation, Uses of plants.

Unit -II: Loss of biodiversity:

(12hrs)

- i. Loss of genetic diversity, Loss of species diversity, Loss of ecosystem diversity,
Loss of agro biodiversity, projected scenario for biodiversity loss
- ii. Management of plant biodiversity: Organizations associated with biodiversity management-Methodology for execution-IUCN, UNEP, UNESCO, WWF, NBPGR; Biodiversity legislation and conservations, Biodiversity information management and communication.

Unit-III: Contemporary practices in resource management:

(12hrs)

- i. Environmental Impact Assessment (EIA), Geographical Information System GIS, Participatory resource appraisal, Ecological footprint with emphasis on carbon footprint, Resource accounting;
- ii. Solid and liquid waste management

Unit -IV: Conservation of biodiversity

(12hrs)

- i. Conservation of genetic diversity, species diversity and ecosystem diversity, *In situ* and *ex situ* conservation,
- ii. Social approaches to conservation, Biodiversity awareness programmes, Sustainable development

Unit- V: Role of plants in relation to Human Welfare

(12hrs)

- i. Importance of forestry, their utilization and commercial aspects-
 - a) Avenue trees, b) ornamental plants of India. c) Alcoholic beverages through ages.
- ii. Fruits and nuts: Important fruit crops their commercial importance. Wood, fiber and their uses.

BOT-136

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY

III B. Sc - BOTANY SYLLABUS SEMESTER- VI

Practical Syllabus,

Paper VIII-(C):

VIII-CI:PLANT DIVERSITY AND HUMAN WELFARE

Total hours of teaching 30hrs

@ 2hrs per week

1. Study of plant diversity (flowering plants).
2. Study of exotic species- Identification and morphological characteristics
3. Identification of forest trees through bark, wood, flowers, leaves and fruits
4. Maceration, Study of wood (Tracheary elements, fibres)
5. Methods of preservation and canning of fruits.
6. Visit to the local ecosystem to study the plants.
7. Write up on the conservation efforts of International organizations
8. Study of Solid and Liquid waste management systems in rural/urban areas.

Domain skills expected to achieve:

Identification of exotic plant species, identification of forest trees based on the characteristics of bark, flowers and fruits, understanding the preservation methods of fresh and dry fruits, understanding the methods of safe disposal of biodegradable and non-biodegradable wastes

BOT - 137

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY

III B. Sc - BOTANY SYLLABUS SEMESTER- VIII CLUSTER

Paper VIII-C-2: Pharmacognosy and Phytochemistry

Total hours of teaching 60hrs @ 3hrs per week

Unit-I: Pharmacognosy (12hrs)

Definition, Importance, Classification of drugs - Chemical and Pharmacological, Drug evaluation methods

Unit -II: Organoleptic and microscopic studies: (12hrs)

Organoleptic and microscopic studies with reference to nature of active principles and common adulterant of *Alstonia scholaris* (bark), *Adhatoda vasica* (leaf), *Strychnos nuxvomica* (seed), *Rauwolfia serpentine* (root) and *Zinziber officinalis Catharanthus roseus*.

Unit-III: Secondary Metabolites: (12hrs)

i. Definition of primary and secondary metabolites and their differences, major types - terpenes, phenolics, alkaloids, terpenoids, steroids.

ii. A brief idea about extraction of alkaloids. Origin of secondary metabolites - detailed account of acetate pathway, mevalonate pathway, shikimate pathway.

UNIT-IV: Phytochemistry: (12hrs)

Biosynthesis and sources of drugs:

- i. Phenols and phenolic glycosides : structural types, biosynthesis, importance of simple phenolic compounds, tannins, anthraquinones, coumarins and furanocoumarins, flavones and related flavonoid glycosides, anthocyanins, betacyanins, stilbenes, lignins and lignans).
- ii. Steroids, sterols, saponins, withanolides, ecdysones, cucurbitacins: Biosynthesis, commercial importance.
- iii. Alkaloids: Different groups, biosynthesis, bioactivity. Volatile oils, aromathera

UNIT-V: Enzymes, proteins and amino acids as drugs: (12hrs)

- i. Vaccines, toxins and toxoids, antitoxins, immune globulins, antiserums,
- ii. Vitamins, Antibiotics - chemical nature, mode of action.
- iii. Pharmacological action of plant drugs - tumor inhibitors, PAF antagonists, antioxidants, phytoestrogens and others.
- iv. Role of different enzyme inhibitors.

BOT138
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY

III B.Sc., - Botany - VIII-C-CIII / VI Semester End (W.E.F. 2018-19)

Bioinformatics

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

Total Credits : 03

Unit 1. Introduction to Bioinformatics

5hrs

Introduction, Branches of Bioinformatics, Aim, Scope and Research areas of Bioinformatics.

Unit 2. Databases in Bioinformatics

5hrs

Introduction, Biological Databases, Classification format of Biological Databases, Biological Database Retrieval System.

Unit 3. Biological Sequence Databases

(25 Lectures)

National Center for Biotechnology Information (NCBI): Tools and Databases of NCBI, Database Retrieval Tool, Sequence Submission to NCBI, Basic local alignment search tool (BLAST), Nucleotide Database, Protein Database, Gene Expression Database.

EMBL Nucleotide Sequence Database (EMBL-Bank): Introduction, Sequence Retrieval, Sequence Submission to EMBL, Sequence analysis tools.

DNA Data Bank of Japan (DDBJ): Introduction, Resources at DDBJ, Data Submission at DDBJ.

Protein Information Resource (PIR): About PIR, Resources of PIR, Databases of PIR Retrieval in PIR.

Swiss-Prot: Introduction and Salient Features.

Unit 4. Sequence Alignments

(10 Lectures)

Introduction, Concept of Alignment, Multiple Sequence Alignment (MSA), MSA by CLUSTALW, Scoring Matrices, Percent Accepted Mutation (PAM), Blocks of Amino Acid Substitution Matrix (BLOSUM).

Unit 5. Applications of Bioinformatics

(7 Lectures)

Structural Bioinformatics in Drug Discovery, Quantitative structure-activity relationship (QSAR) techniques in Drug Design, Microbial genome applications, Crop improvement

Suggested Readings :

1. Ghosh Z. and Bibekanand M. (2008) *Bioinformatics: Principles and Applications*. Oxford University Press.
2. Pevsner J. (2009) *Bioinformatics and Functional Genomics*. II Edition. Wiley-Blackwell.
3. Campbell A. M., Heyer L. J. (2006) *Discovering Genomics, Proteomics and Bioinformatics*.II Edition. Benjamin Cummings.

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY
III B.Sc., Botany Practical Paper – VIII-C-CIII Practical Syllabus (w.e.f. 2018-19)
(Bioinformatics-BOT138)

Total hours of laboratory Exercises 30hrs @ 2 per week

Credits 2

Practical

1. Nucleic acid and protein databases.
2. Sequence retrieval from databases.
3. Sequence alignment.
4. Sequence homology and Gene annotation.
5. Construction of phylogenetic tree

BOT -133
GOVERNMENT COLLEGE (AUTONOMOUS) RAJAMAHENDRAVARAM
I B.SC. HORTICULTURE-1/I SEMESTER END (W.E.F) 2018-19
THEORY SYLLABUS

PAPER -I Basic Concepts of Horticulture And Soil Science

Total Hours of Teaching 60 Hrs @ 4 Hrs per Week

Credits : 03

Unit I : Introduction to horticulture

12 hrs

1. Definition of Horticulture, Importance of Horticulture In Terms of Economy, Production, Employment Of Generation Environmental Protection And Human Resource Development
2. Scope Of Horticulture In India
3. Division of Horticulture with Suitable Examples and Their Importance.
4. Fruit And Vegetable Zones of India And Andhra Pradesh

Unit II : Classification and nutritional values of horticulture crops

12hrs

1. Classification of Horticultural crops based on soil and climatic requirements
2. Nutritive value of horticultural crops
3. Global scenario of horticultural crops- horticultural therapy
4. Export and import of horticultural plants

Unit III : Environmental factors – horticultural crops

12 hrs

1. Influence of soil – physical and chemical properties.
2. Climatic factors – light, photoperiod, temperature relative humidity, rainfall,
3. Micro climate, pollution
4. Influence of biotic and abiotic stresses on crop production.

Unit IV : Soil as a medium for plant growth

12 hrs

1. Mineral and weathering to form soils, factors of soil formation.
2. Soil taxonomy, soil colour, texture, and structure, other physical properties and stabilities.
3. Soil colloids and charges; ion absorption and exchange.
4. Soil pH and acidity, soil alkalinity and salinity.

Unit V : Mineral nutrition of plants

12 hrs

1. Macro and micro nutrients.
2. Soil organic matter.
3. Soil micro organisms; soil faunal ecology.
4. Integrated nutrient management and soil test.

Additional Inputs:

1. Bio fertilizers
2. Loam Soils

Suggested readings :

- Kumar, N. 1990. Introduction to Horticulture, Rajyalakshmi Publications, Nagarcoil, Tamilnadu.
- Jitendra Sing, 2002. Basic Horticulture, Kalyani Publishers, Hyderabad.
- Yerima Bernard P.K. and E. van Ranst, 2005. Introduction to Soil Science, Trafford Publishing.

BOT -133
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM
I B.Sc., Horticulture Practical Paper - I Practical Syllabus (w.e.f. 2018-19)
(Basic concepts of Horticulture and Soil Science)
Total hours of laboratory Exercises 30hrs @ 2 per week Credits 2

1. Study of tools and implements in horticulture.
2. Layout of different planting systems.
3. Layout of nutrition garden.
4. Preparation of nursery beds for sowing of vegetable seeds.
5. Digging of pits for fruit plants.
6. Preparation of fertilizer mixtures and field application.
7. Identification and management of nutritional disorders in vegetables.
8. Collection and preparation of soil samples, estimation of moisture, EC, pH and bulk density.
9. Textural analysis of soil by Robinson's pipette method, chemical analysis of soil - Fe₂O₃, P, K, Ca, Mg and S, total N, organic carbon and cation exchange capacity

BOT - 134
GOVERNMENT COLLEGE (AUTONOMOUS) RAJAHMUNDRY
I B.SC. HORTICULTURE-2/II SEMESTER END (w.e.f. 2018-19)
THEORY SYLLABUS
PAPER -II Plant Propagation Methods and Nursery Management
Total Hours of Teaching 60 Hrs @ 4 Hrs per Week **Credits : 03**

UNIT - I: Basics of propagation; structures and media for propagation methods
12hrs

1. Introduction, principles and classification of plant propagation methods.
2. Selection of site for commercial nursery.
3. Ecological and economic factors
4. Plant propagation structures, containers and media.

Unit - II : Sexual propagation/Seed propagation **12hrs**

1. Sexual propagation and its importance.
2. Process of seed germination.
3. Factors affecting seed germination.
4. Pre-germination treatments and viability tests.

Unit - III : Propagation through vegetative organs **12 hrs**

1. Asexual propagation and its importance.
2. Underground vegetative organs for plant multiplication (macro propagation).
3. Orchid propagation by rhizome.
4. Propagation by division and separation.

Unit - IV : Vegetative propagation techniques **12 hrs**

1. Propagation by cuttings : Root, leaf and stem cuttings
2. Plant propagation by layering – simple, serpentine, mound and air layering.
3. Plant propagation by grafting – approach and detached (whip, cleft, side veneer and bark).
4. Plant propagation by budding – T – patch and chip budding techniques.

Unit - V : Nursery management practices **12 hrs**

1. Definition of nursery; nursery – site selection, layout, records.
2. Different types of nursery beds – flat beds, raised beds and sunken beds, their merits and demerits.
3. Nursery structures – potting, repotting, different nursery techniques and their management.

4. Problems in nursery management and its control, nursery accreditation and certification.

Suggested Readings:

- Sadhu, M.K. 1996. Plant propagation. New age international publishers, New Delhi
- Sarma, R.R. 2002. Propagation of horticultural crops. Principles and practices, Kalyani publishers, New Delhi
- Hartman, HT and Kester, D.E. 1976, Plant propagation. Principles and practices, prentice Hall of India Pvt. Ltd., Bombay

BOT -134
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY
I B.Sc., Botany Practical Examinations at the end of II Semester
(Plant Propagation Methods and Nursery Management)
Practical Paper - II model (w.e.f. 2018-19)

1. Media for propagation of plants in nursery beds, pot and mist chamber
2. Preparation of nursery beds and sowing seeds, raising of rootstock
3. Seed treatments for breaking dormancy
4. Preparation of plant material for potting. Hardening plants in the nursery
5. Practicing different types of cuttings, layering, graftings And budding
6. Preparation of plant growth regulators for seed germination and vegetative propagation

BOT - 140
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM
II B.Sc., - Horticulture - 3 / III Semester End (W.E.F. 2019-20)
Olericulture

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

Unit – 1 : Solanaceous vegetables **(12 Hrs.)**

Importance, morphology and taxonomy, varieties, climate and soil, seeds and sowing, manuring, irrigation, intercultural operations, diseases and their control, harvesting and yield of following crops: 1. Cultivation of Brinjal 2. Cultivation of tomato 3. Cultivation of Chillies

Unit – 2 : Leafy vegetables **(12 Hrs.)**

Importance, morphology and taxonomy, Propagation, manuring, irrigation, harvesting and yield of following crops: 1. Cultivation of Spinach 2. Cultivation of Mentha

Unit – 3 : Root and Tuber crops **(12 Hrs.)**

Importance, morphology and taxonomy, Propagation, manuring, irrigation, harvesting and yield of following crops: 1. Cultivation of Colocasia 2. Cultivation of Sweet Potato 3. Cultivation of Carrot

Unit – 4 : Cole crops **(12 Hrs.)**

Importance, morphology and taxonomy, Propagation, manuring, irrigation, harvesting and yield of following crops: 1. Cultivation of Cabbage 2. Cultivation of Cauliflower

Unit – 5 : Leguminous vegetables **(12 Hrs.)**

Importance, morphology and taxonomy, Propagation, manuring, irrigation, harvesting and yield of following crops: 1. Cultivation of Cluster bean 2. Cultivation of Dolichos

Additional Inputs:

Inter Cultural Operations Project

Suggested readings :

- Bose T K et al. (2003) Vegetable crops, Naya Udhyog Publishers, Kolkata.
- Singh D K (2007) Modern vegetable varieties and production, IBN Publisher Technologies, International Book Distributing Co, Lucknow.
- Premnath, Sundari Velayudhan and D P Sing (1987) Vegetables for the tropical region, ICAR, New Delhi

BOT – 106
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM
II B.Sc., Horticulture Practical Paper - III Practical Syllabus (w.e.f. 2019-20)
(Olericulture)

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

1. Identification of vegetable seeds and vegetable crops at different growth stages
2. Sowing/ transplanting of vegetables in main field
3. Determining the germination percentage of vegetable seed
4. Preparing vegetable nursery beds
5. Raising vegetable seedlings in nursery bed and portrays
6. Land preparation for sowing/ transplanting of vegetable crops
7. Fertilizer application for vegetable growing
8. Identification of major diseases and insect pests of vegetables
9. Visit to vegetable field to study methods of vegetable cultivation

BOT -141

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY

II B.Sc., - Horticulture -4/ IV Semester End (w.e.f. 2018-19)

Ornamental Horticulture, Floriculture and Landscaping

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

Total Credits : 03

Unit - 1: Leafy and flower ornamentals (12 Hrs.)

1. Introduction and classification of ornamentals.
2. Different types of leafy ornamentals.
3. Different types of flower ornamentals.
4. Commercial value of ornamentals in India and abroad.

Unit - 2: Fundamentals of Landscaping (14 Hrs.)

1. Principles, importance and scope of landscaping.
2. History, art principles, important terms of landscape gardening; garden adornments.
3. Garden features: wall, fencing, steps, garden, lawn, carpet bedding; flower beds, water gardens, bonsai.
4. Garden types and styles: Indoor and outdoor gardens; Formal, informal, free style, special type, terrace, rock and sunken garden styles

Unit - 3: Cultivation of ornamentals (16 Hrs.)

1. Importance, description, cultivation and use of annuals; biennials, herbaceous perennials, woody perennials.
2. Identification, classification and growth habits of ornamental trees, shrubs and climbers used for various purposes.
3. Cacti and succulents, ferns, palms and foliage plants.
4. Flower shows, judging. Flower arrangements. Growing of flowers for exhibitions and competitions.

Unit - 4: Commercial floriculture (10 Hrs.)

1. Scope and importance of commercial floriculture in India
2. Cultivation of Rose, Jasmine, Chrysanthemum and Marigold
3. Cultivation of Tuberose, Aster and Dahlia
4. Cultivation of Gerbera, Gladiolus

Unit - 5: Management practices for ornamental plants (08 Hrs.)

1. Plant protection; use of Plant Growth Regulators.
2. Special horticultural practices.
3. Harvesting and post-harvest handling.
4. Grading, packing, storage and marketing of ornamental flowers.

Suggested Readings:

1. Das P, G Marti and R S Duha (1999) Floriculture and Landscaping P Sales Pvt.Ltd.
2. Sabina, GT and Peter KV. 2008. Ornamental Plants for Gardens. New India Publ. Agency.
3. Lauria A and Victor HR. 2001. Floriculture - Fundamentals and Practices Agrobios. → Nambisan KMP.1992. Design Elements of Landscape Gardening. Oxford IBH.

BOT - 141
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY

**I IB.Sc., Botany Practical Examinations at the end of IV Semester
(Ornamental Horticulture, Floriculture and Landscaping)**

Practical Paper - IV model (w.e.f. 2019-20)

1. Identification, classification and description of annuals, herbaceous perennials, bulbous plants, cacti and succulents, foliage plants, ferns and palms.
2. Bonsai culture and flower arrangements.
3. Identification of garden components, lawn, annuals, shrubs, climbers, creepers, cactus, succulents, trees with specialized gardens, line roof garden, Japanese garden.
4. Visit to floriculture farms.
5. Visit to different gardens to observe landscaping components and styles.