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 Archaebacteria, 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). 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 McGrawHill 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.

BOT-160
GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM
I B.Sc., – Botany Core Course-2 / II Semester (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) up to divisions.
2. Occurrence, morphology, anatomy, reproduction (developmental details are not needed) and life history of (a) *Lycopodium* (Lycopsida) and (b) *Marsilea* (Filicopsida).
3. Stelar 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;
5. Systematic description and economic importance of the following families: (a) Annonaceae (b) Curcurbitaceae

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)CryptogamicBotanyVol. 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) Springe-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
- Mani, M.S (1974)Ecology¬ & Biogeography of India Dr. W. Junk Publishers, The Haque

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., – 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)

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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.

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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**

Course Objectives: Plant Taxonomy and Embryology

- To study and understand the plant taxa and classification of Angiosperms.
- To study the families of angiosperms.
- To critically understand various taxonomical aids for identification of angiosperms.
- To analyze the morphology of the most common angiosperms of their localities and recognize their families.
- To illustrate and interrupt various aspects of embryology.

Unit -1 Introduction to Plant Taxonomy **(12 h)**

1. Fundamental components of taxonomy (identification, nomenclature, classification)
2. Taxonomic resources: Herbarium, Herbaria of National and International importance.
3. 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)**

1. Types of classification- Artificial, Natural and Phylogenetic.
2. Bentham & Hooker's system of classification- merits and demerits.
3. Hutchinson system of classification- merits and demerits
4. Phylogeny, Origin and Evolution of Angiosperms; Angiospermic Phylogenitic Group – (APG IV – 2016 Classification)

Unit - 3 Systematic Taxonomy - I **(12 h)**

1. Systematic study and economic importance of plants belong to the following families:
2. **Polypetalous :** Annonaceae, Brassicaceae, Rutaceae, Cucurbitaceae and Apiaceae.

Unit - 4 Systematic Taxonomy - II **(12 h)**

1. Systematic study and Economic importance of plants belong to the following
2. families:
3. **Gamopetalous :** Asteraceae, Asclepiadaceae and Lamiaceae
4. **Monochlamydeous :** Euphorbiaceae
5. **Monocotyledonous** : Poaceae

Unit - 5 Embryology **(12 h)**

1. Anther structure, microsporogenesis and development of male gametophyte.
2. Ovule structure and types.
3. Megasporogenesis; development of Monosporic (*Polygonum, Oenothera*), Bisporic (*Allium, Endymion*) and Tetrasporic (*Peperomia, Drusa* and *Adoxa* types).
4. Pollination and Fertilization (out lines) Endosperm development and types.
5. 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

Learning outcomes:

- Students can acquire the knowledge of classification of plants.
- One can identify the important plant species in our daily life.
- Students can acquire knowledge to maintain Botanical gardens.
- Students can gain knowledge about Embryo structure and their development.

Employability:

1. Knowledge about medicinally useful plants can create opportunities in Ayurveda.
2. Cultivation of Orchids can create self-employability.
3. Knowledge about apomixis useful in the process of hybrid seed production.

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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
9. Isolation and mounting of embryo (using *Symopsis / Senna / Crotalaria*)
10. Field visits. Study of local flora and submission of Field Note Book.

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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 (C_3, C_4 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.

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, Austalia & 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.

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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 permiability 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,

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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**

Course Objectives:

- To study the ultra structure of cell and cell organelles.
- To study the genetics and plant breeding.

Unit - 1 Cell Biology **(12 h)**

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

Unit – 2 Genetic material **(12 h)**

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

Unit – 3 Inheritance **(12 h)**

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

Unit – 4 Plant breeding **(12 h)**

1. Introduction and Objectives of plant breeding.
2. 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)**

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

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)

Learning outcomes:

- Students can acquire the knowledge about the cell and its structure.
- Students can gain the knowledge about the functional role of cell in metabolism.
- Students can acquire knowledge about the structure of chromosome, DNA and its replication, transcription and translation processes involved in the expression of phenotypic characters.
- Students can acquire knowledge about the process of plant breeding programme to produce a new verity useful in agriculture and horticulture.

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

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GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

III B.Sc., BotanyPracticalPaper - 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- 129

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**

Objectives:

- To study and understand Ecology and eco-systems.
- To study and observe the phytogeographic regions of India and World.

Unit – 1 Elements of Ecology **(12 h)**

1. Ecology: Introduction, Scope, Importance.
2. Light Factors.
3. Temperature Factors.
4. Edaphic Factor: Origin, formation, composition and soil profile.
5. Biotic Factor: Interactions between plants and animals.

Unit – 2 Ecosystem **(12 h)**

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

Unit – 3 Population and Community Ecology **(12 h)**

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

Unit – 4 Phytogeography **(12 h)**

1. Principles of Phytogeography, Distribution (wides, endemic, discontinuous species).
2. Phytogeographic regions of India
3. Phytogeographic regions of World
4. Endemism – Introduction, types and causes, Endemic Species and Their Conservation.(out Lines)

Unit – 5 Plant Biodiversity **(12 h)**

1. Biodiversity – Introduction, Earth summit, Levels of biodiversity - genetic, species and Ecosystem.
2. Biodiversity hotspots of India.
3. Loss of biodiversity – causes and conservation (*In-situ* and *ex-situ* methods).
4. 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., NewDelhi.
- **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 Haque
- **Good, R. (1997):***The Geography of flowering Plants (2nd Edn.)* Longmans, Green & Co., Inc., London & Allied Science Publishers, New Delhi

Learning Outcomes:

- Students can acquire the knowledge about ecological factors like light, temperature, air, water and soil
- Students can acquire knowledge about the structure of Ecosystem, Ecological pyramids, food wed, food chain and energy flow in an ecosystem.
- Students can know the importance of biodiversity and its conservation strategies.
- Students can acquire knowledge about the phytogeographical zone of world and India.

BOT – 129

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

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

(Plant Ecology and Phytogeography)

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1. Study of instruments used to measure microclimatic variables; soil thermometer, maximum and minimum thermometer, anemometer, rain gauze, 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

IIIB.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

BOT -122

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY

II B.Sc., Botany Practical Paper - +VIIA 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

IIIB.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, Anthuriams, Marigold, Rose, Lilium)
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.

Learning Outcomes :

Raising a nursery, managing it, studying and drawing various land scaping 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

Employability

- Florists
- Landscaper

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), land scape drawings using computers, raising of healthy nurseries of flowering plants, managing vase life of cut flowers etc.

BOT-142

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY

I 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 - 1 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) Biopestcides **:** *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-142

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

IIIB.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)**

2. History of plant tissue culture research - basic principles of plant tissue culture, meristem culture, organ culture, Totipotency of cells, differentiation and dedifferentiation.
3. 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.
4. 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 (12**hrs)**

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

Learning outcomes:

- Students can acquire knowledge how to handle tissue culture laboratory and equipment.
- Students can acquire knowledge about the process of micro propagation and its importance in generating virus free plants.
- Students can acquire research skills.
- Students can know the use of genetic engineering in developing hybrid plants which are resistant to various pests andinsects.

Employability:

- Students can create their opportunities in the field of biotechnology and genetic engineering laboratories by acquiring tissue culture and gene transfer skills.

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)

Ethanbotany 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. Plasnts 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 enthnobotany modern medicine with special examples *Rauwolfia serpantina, Trichopus zeylanicus, Artemisia annuna, Withania somnifera*.
2. Medico- ethanobotanical sources in India.
3. Significance of the following plants in ethnobotanical practices. (along with their habitat and morpholigy) a) *Azadiracta indica,* b*) Ocmium 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, scope and importance of medicinal plants Indigenous medicinal system. 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

   Rama Ro, N and A.N. Henry (1996). The Ethnobotany of Eastern Ghats in Andhra Pradesh, India.Botanical Survey of India. Howrah.
6. Trivedi P C, 2006. Medicinal Plants: Ethnobotanical Approach, Agrobios, India.
7. Purohit and Vyas, 2008. Medicinal Plant Cultivation: A Scientific Approach, 2nd edn. Agrobios, India.
8. Pal, D.C. & Jain, S.K., 1998. Tribal Medicine. Naya Prakash Publishers, Calcutta
9. 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.

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY

Learning outcomes:

- Students can acquire knowledge about traditional medical systems like Ayurveda, sidda and Unani.
- Students can know about the medicinal value of various plants.
- Students cab acquire knowledge about the tribal medicines and how they were utilized by the tribal people.

Employability:

- Students can utilize their knowledge in the field of Ayurveda and Sidda medicine and can create their own opportunities.

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. 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)

1. Structure of Dicot and Monocot seeds; outgrowths of seeds.
2. Seed dormancy and reasons for seed dormancy.
3. Methods of breaking seed dormancy.
4. Seed storage methods.

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

1. Seed banks – necessity, working mode, types of seeds stored, seed banks around globe.
2. Seed viability – measures of seed viability, factors affecting seed viability.
3. Genetic erosion – introduction, causes, and examples in India and abroad; measures to check genetic erosion.
4. Seed testing; seed certification.

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

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

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

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

Unit –V: Floriculture & Landscaping (12 h)

1. Floriculture – introduction; potential and trade in India; cultivation of *Chrysanthemum* and rose
2. Landscaping – introduction, goals, categories, designing, elements; planning residential and non-residential land scapes; plant arrangement in land scape. Computer applications in landscaping.
3. 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
- **Dadheeoh, 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 Acquaah (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

Learning Outcomes:

- Students can acquire knowledge of Seed structure and its germination processes.
- Students can know the importance of seed storage and certification processes.
- Students can acquire knowledge to maintain the Nurseries and gardens.
- Students can learn the propagation techniques and floriculture techniques.

Employability:

- Students can get opportunities in Nurseries.
- Students can get opportunities in seed companies

BOT132

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY

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

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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 anddouble beam, double wavelength spectrophotometers), Infrared spectrometers - Luminometry and densitometry – principles and their applications - Mass Spectroscopy- principlesof analysis, application in Biology.

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

Chromatographic techniques: Principle and applications – Column - thin layer –paper, affinity and gaschromatography - Gel filtration - Ion exchange and High performance liquid chromatography techniques– Examplesof 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
6. writing for agricultural research scientists – a training reference manual.
7. West Africa Rice Development Association, Hong Kong.
8. Ruzin, S.E. (1999). Plant micro technique and microscopy. Oxford
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.

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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**

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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 – culturingof*Pleurotus* mycelium on Petriplates, preparation of mother spawn in salinebottle 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, pickels, papads), drying, storage in saltsolutions. Nutrition - Proteins - amino acids, mineral elements nutrition - Carbohydrates, Crude fibre content – Vitamins.

Unit V:FoodPreparation: *(12 Hrs)*

Types of foods prepared from mushrooms;soup,cutlet omlette,samosa,pickles and curry .ResearchCentres - 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**

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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.
8. Incubation and harvesting of mushrooms (collection, drying and preservation).
9. Diseases of mushrooms (photographs).
10. Post-harvest technology steps (photographs).
11. Study tour to mushroom cultivation farms
12. 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)**

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

Unit -II: Loss of biodiversity: **(12hrs)**

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

Unit-III: Contemporary practices in resource management: **(12hrs)**

1. Environmental Impact Assessment (EIA), Geographical Information SystemGIS, Participatory resource appraisal.
2. Ecological footprint with emphasis on carbon footprint, Resource accounting;
3. Solid and liquid waste management

Unit -IV: Conservation of biodiversity **(12hrs)**

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

Unit- V: Role of plants in relation to Human Welfare **(12hrs)**

1. Importance of forestry, their utilization and commercial aspects-
   a) Avenue trees, b) ornamental plants of India. c) Alcoholic beverages through ages.
2. 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 teaching30hrs @ 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)

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

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

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

Unit-III: Secondary Metabolites: **(12hrs)**

1. Definition of primary and secondary metabolites and their differences, major types - terpenes, phenolics, alkaloids, terpenoids, steroids.
2. 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:

2. Phenols and phenolic glycosides : structural types, biosynthesis, importance ofsimple phenolic compounds, tannins, anthraquinones, coumarins and furanocoumarins, flavones and related flavonoid glycosides, anthocyanins, betacyanins, stilbenes, lignins and lignans).

3. Steroids, sterols, saponins, withanolides, ecdysones,cucurbitacins: Biosynthesis, commercial importance.

4. Alkaloids: Different groups, biosynthesis, bioactivity. Volatile oils, aromathera

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

1. Vaccines, toxins and toxoids, antitoxins, immune globulins, antiserums,
2. Vitamins, Antibiotics – chemical nature, mode of action.
3. Pharmacological action of plant drugs – tumor inhibitors, PAF antagonists, antioxidants, phytoestrogens and others.
   i. 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**

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

Unit 2. Databases in Bioinformatics 5hrs

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

Unit 3. Biological Sequence Databases **(25 Lectures)**

1. 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.

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

3. DNA Data Bank of Japan (DDBJ): Introduction, Resources at DDBJ, Data Submission at DDBJ.
4. Protein Information Resource (PIR): About PIR, Resources of PIR, Databases of PIRRetrieval in PIR.

5. Swiss-Prot: Introduction and Salient Features.

Unit 4. Sequence Alignments **(10 Lectures)**

1. 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)**

1. 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)

(Bioinformatic
s-BOT 138)

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