

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

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, Anthuriums, Marigold, Rose, Lilium)
3. Management of pests, diseases and harvesting.
4. Methods of harvesting.

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY

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
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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-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 - 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) **Milletts** : 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 longa*

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) *Azadirachta indica*
 - o) *Lawsonia inermis*
 - p) *Curcuma longa*
 - 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.

Unit I: PLANT TISSUE CULTURE - 1**(12hrs)**

- History of plant tissue culture research - basic principles of plant tissue culture, meristem culture, organ culture, Totipotency of cells, differentiation and dedifferentiation.
- 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.
- Callus subculture maintenance, growth measurements, morphogenesis in callus culture – organogenesis, somatic embryogenesis.

UNIT-II: Plant Tissue culture -2**(12hrs)**

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

Unit III: Recombinant DNA technology**(12hrs)**

- Restriction Endonucleases (history, types I-IV, biological role and application); concepts of restriction mapping.
- Cloning Vectors: Prokaryotic (pUC 18, pBR322, Ti plasmid and Lambda phage, Eukaryotic Vectors (YAC and briefly PAC)
- Gene cloning (Bacterial Transformation and selection of recombinant clones, PCR mediated gene cloning)
- 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)**

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

Unit V: Applications of Biotechnology**(12 hrs)**

- Applications of plant genetic engineering – crop improvement herbicide resistance, insect resistance, Virus resistance
- 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 and insects.

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)
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) *Azadirachta indica*, b) *Ocimum sanctum*, c) *Vitex negundo*, d) *Gloriosa 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 : Ethnobotany 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 can 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

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
- **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 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)

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
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.

BOT - 125
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 – *Volvariella volvacea*, *Pleurotus citrinopileatus*, *Agaricus bisporus*. 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, omlette, 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.
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 System GIS, 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), RAJAHMUNDRI
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), *Rauwolfia serpentine* (root) and *Zinziber officinalis Catharanthus 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 of simple 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 PIR Retrieval 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