BOTANY

GOVERNMENT COLLEGE FOR WOMEN(A)
GUNTUR
BOTANY & HORTICULTURE

COURSES INFORMATION

DEPT OF BOTANY

CONTENTS

Vision and Mission of the Department

Vision

To educate the students for protection of a sustainable environment through the knowledge of plant world

To educate and support women in botany, fostering curiosity, research, and environmental responsibility

Mission

- Creating awareness about plant world for protecting ecological balance.
- Collecting, conserving plants, and maintaining gardens.
- Providing experiential learning through field trips, workshops and internships
- Fostering curiosity, research, through study projects and exhibitions
- Integrating information technology tools and platforms into the curriculum to enhance students' proficiency in the field of botany
- Providing transformative learning environment, equipped with comprehensive botanical knowledge, critical thinking skills, and a deep understanding of plant sciences

Aim of Botany Programme:

The aim of B. Sc Botany program is to deepen the understanding of plants and their significance for humanity and the environment, leading to advancements in agriculture, conservation, medicine, and sustainable development.

Objectives for a B.Sc. Botany programme:

- Introduce fundamental concepts of botany including plant morphology, anatomy, physiology, genetics, ecology, and evolution.
- Provide hands-on experience in laboratory techniques and fieldwork to analyze and interpret plant specimens and data.
- Encourage inquiry-based learning to develop students' ability to ask questions, formulate hypotheses, and evaluate evidence.
- Integrate knowledge from related fields such as chemistry, zoology, microbiology and biotechnology to provide a comprehensive understanding of plant biology.
- Enhance written and oral communication skills to effectively convey scientific ideas and findings to diverse audiences.
- Foster independent research projects to develop students' skills in experimentation, data analysis, and dissemination of findings.
- Instill ethical values and responsibility towards research protection of environment and conservation of biodiversity.

Equip students with the skills and competencies needed for careers in academia, research, government agencies, conservation organizations, and agribusiness. These objectives aim to produce graduates who are well-prepared to address challenges in plant sciences, conservation, and sustainable development.

- **Program Specific outcomes of B.Sc. Botany**

PSO	After completion of the B.Sc. Mathematics programme, students will be able to
PSO 1	Understand the basic concepts of plant diversity from simple to complex from aquatic to land inhabitants. Understand the representative forms in Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms and Taxonomy of angiosperms and their distribution
PSO 2	Apply and Analyse the concepts of Anatomy, Embryology, Cell biology, Genetics, Ecology and plant Physiology and conservation of Biodiversity
PSO 3	justify the applications of Botany develop skills in Plant propagation, Seed technology tissue culture etc in improving Agriculture and Horticulture and design and develop strategies for conservation of Biodiversity

List of Programmes offered by the Department

S. No	Title of the programme
1	B. Sc, Botany Major
2	B.Sc. Botany, Horticulture, Chemistry
3	B.Sc. Botany, Zoology, Chemistry
4	B.Sc. Microbiology, Botany, Chemistry
5	B.Sc. Biotechnology, Botany Chemistry

B.Sc Botany course structure (Three major system)

Year	Semester	Paper/course	Subject Title	Paper Code
			Botany	
I	I	I	Fundamentals of Microbes and Non-vascular Plants	BOT401-1
			Practical-I	BOT401-1
	II	II	Basics of Vascular Plants and Phytogeography	BOT401-2
			Practical-II	BOT401-2
	Community Service Project			
II	**III**	**III**	**Anatomy and Embryology of Angiosperms, Plant Ecology and Biodiversity**	**BOT401-3**
			Practical-III	**BOT401-3**
	IV	**IV**	**Plant Physiology and metabolism**	**BOT401-4**
			Practical -IV	**BOT401-4**
		V	**Cell Biology, Genetics and Plant Breeding**	**BOT401-5**
			Practical -V	**BOT401-5**
	Short term internship			
III	V	VI A	**Plant Propagation** OR Plant tissue culture & Biotechnology	BOT401-6A
			Practical	BOT401-6A
		VII A	**Seed Technology** OR Mushroom cultivation	BOT401-7A
			Practical	BOT401-7A
	Semester end Internship			

B.Sc Horticulture course structure (Three major system)

III & IV Semesters 2023-24

Year	semester	paper	Title	course code
II	III	III	OLERICULTURE	HORT 4-3
			Practical III	HORT 4-3
	IV	IV	POMOLOGY	HORT 4-4
			Practical IV	HORT 4-4
	IV	V	PLANT PESTS & DISEASE MANAGEMENT	HORT 4-5
			Practical V	HORT 4- 5

B.Sc., Botany course structure: (Single major system)

COURSE STRUCTURE

Year	Semester	Course		Course code
I	I	1	Introduction to Classical Biology	
		2	Introduction to Applied Biology	
	II	3	Non-vascular Plants –(T)	H401-1
			Non-vascular Plants –(P)	H401-1
		4	Origin of Life and Diversity of Microbes –(T)	H401-2
			Origin of Life and Diversity of Microbes –(P)	H401-2
			Community Service project	
II	III	5	Vascular Plants –(T)	H401-3
			Vascular Plants –(P)	H401-3
		6	Plant Pathology and Plant Diseases–(T)	H401-4
			Plant Pathology and Plant Diseases –(P)	H401-4
		7	Plant Breeding–(T)	H401-5
			Plant Breeding –(P)	H401-5
		8	Plant Biotechnology–(T)	H401-6
			Plant Biotechnology–(P)	H401-6
	I V	9	Anatomy and Embryology of Angiosperms–(T)	H401-7
			Anatomy and Embryology of Angiosperms–(P)	H401-7
		10	Plant Ecology, Biodiversity and Phytogeography–(T)	H401-8
			Plant Ecology, Biodiversity and Phytogeography–(P)	H401-8
		11	Plant Resources and Utilization–(T)	H401-9
			Plant Resources and Utilization–(P)	H401-9
			Shprt Internship/ Apprenticeship	
III	V	12	Cell Biology and Genetics–(T)	H401-10
			Cell Biology and Genetics–(P)	H401-10
		13	Plant Physiology and Metabolism–(T)	H401-11
			Plant Physiology and Metabolism–(P)	H401-11
		14 A	Organic Farming–(T)	H401-12
			Organic Farming–(P)	
			OR	
		14 B	Seed Technology–(T)	
			Seed Technology–(P)	
		15 A	Mushroom Culture Technology–(T)	H401-13
			Mushroom Culture Technology–(P)	H401-13
			OR	
		15 B	Plant Propagation Techniques–(T)	
			Plant Propagation Techniques–(P)	
	VI		**Semester Internship/ Apprenticeship**	

.

Year	Semester	Course No. & Title of the course	Course code
IV	VII Core Courses	16 (A) Plant Systematics (OR) 16 (B) Plant Developmental Biology	H401-14
		practical	
		17 (A) Plant Molecular Biology (OR) 17 (B) Plant Genetic Engineering	H401-15
		practical	
		18 (A) Crop Physiology (OR) 18 (B) Plant Biochemistry	H401-16
		practical	
	VII Skill Enhanced Courses (SEC)	19 (A) Phyto-medicines and Ethnobotany (OR) 19 (B) Herbal Technology	H401-17
		practical	
		20 (A) Soil fertility and Conservation (OR) 20 (B) Agroforestry	H401-18
	VIII Core Courses	21 (A) Phyto-biodiversity and Conservation (OR) 21 (B) Phytochemistry and Pharmacognosy	H401-19
		practical	
		22 (A) Bio informatics and Computational Biology (OR) 22 (B) Omics in Plant Science	H401-20
		practical	
		23 (A) Plant Cytogenetics (OR) 23 (B) Biostatistics and Intellectual Property Rights	H401-21
		practical	
	VIII Skill Enhanced Courses (SEC)	24 (A) Bio fertilizers and Bio pesticides (OR) 24 (B) Industrial and Environmental Biotechnology	H401-22
		practical	
		25 (A) Gardening and Landscaping (OR) 25 (B) Floriculture	H401-23
		practical	

List of LSC & SDC offered by the department for 2023-24 :NIL

Course wise Syllabus with Outcomes

Single Major System B.Sc (HONOURS) MAJOR- BOTANY

SEMESTER – I PAPER – I

Course title: INTRODUCTION TO CLASSICAL BIOLOGY

Course: 1

SYLLABUS

Hours/Week: 5 **Credits: 4**

Learning objectives

The student will be able to learn the diversity and classification of living organisms and understand their chemical, cytological, evolutionary and genetic principles.

Learning Outcomes

CO1 know about the the diversity and classification of living organisms and understand anatomical, physiological and reproductive processes and chemical, cytological, evolutionary and genetic principles

CO2 Apply and analyse the various and their chemical, cytological, ecological, evolutionary and genetic principles of living organisms

CO3 Analyse and Evaluate the economic importance of plants and animals and applications of chemistry in daily life and the effect of pollution and climate change and thereby create possible means of solutions

Unit 1: Introduction to systematics, taxonomy and ecology.

1.1. Systematics – Definition and concept, Taxonomy – Definition and hierarchy.

1.2. Nomenclature – ICBN and ICZN, Binomial and trinomial nomenclature.

1.3. Ecology – Concept of ecosystem, Biodiversity and conservation.

1.4. Pollution and climate change.

Unit 2: Essentials of Botany.

2.1. The classification of plant kingdom.

2.2. Plant physiological processes (Photosynthesis, Respiration, Transpiration, phytohormones).

2.3. Structure of flower – Micro and macro sporogenesis, pollination, fertilization and structure of mono and dicot embryos.

2.4 Mushroom cultivation, floriculture and landscaping.

Unit 3: Essentials of Zoology

3.1. The classification of Kingdom Animalia and Chordata.

3.2 Animal Physiology – Basics of Organ Systems & their functions, Hormones and Disorders

3.3 Developmental Biology – Basic process of development (Gametogenesis, Fertilization, Cleavage and Organogenesis)

3.4 Economic Zoology – Sericulture, Apiculture, Aquaculture

Unit 4: Cell biology, Genetics and Evolution

4.1. Cell theory, Ultrastructure of prokaryotic and eukaryotic cell, cell cycle.

4.2. Chromosomes and heredity – Structure of chromosomes, concept of gene.

4.3. Central Dogma of Molecular Biology.

4.4. Origin of life

Unit 5: Essentials of chemistry

5.1. Definition and scope of chemistry, applications of chemistry in daily life.

5.2. Branches of chemistry

5.3. Chemical bonds – ionic, covalent, noncovalent – Vander Waals, hydrophobic, hydrogen bonds.

5.4. Green chemistry

References

1. Sharma O.P., 1993. Plant taxonomy. 2nd Edition. McGraw Hill publishers.

2. Pandey B.P., 2001. The textbook of botany Angiosperms. 4th edition. S. Chand publishers, New Delhi, India.

3. Jordan E.L., Verma P.S., 2018. Chordate Zoology. S. Chand publishers, New Delhi, India.

4. Rastogi, S.C., 2019. Essentials of animal physiology. 4th Edition. New Age International Publishers.

5. Verma P.S., Agarwal V.K., 2006. Cell biology, genetics, Molecular Biology, Evolution anEcology. S. Chand publishers, New Delhi, India.

6. Satyanarayana U., Chakrapani, U., 2013. Biochemistry. 4th Edition. Elsevier publishers.

7. Jain J.L., Sunjay Jain, Nitin Jain, 2000. Fundamentals of Biochemistry. S. Chand publishers, New Delhi, India.

Karen Timberlake, William Timberlake, 2019. Basic chemistry. 5th Edition. Pearson publishers

Single Major System B.Sc (HONOURS) MAJOR- BOTANY

SEMESTER – II

PAPER – II

Course title: Non-Vascular Plants (Algae, Fungi, Lichens and Bryophytes)

Course code: H401-1

Course 3: SYLLABUS

Credits -3 4 Hrs /week

I. Learning Outcomes: On completion of this course students will be able to:

CO1. Understand and compile the characteristics of different groups of nonvascular plants

CO2. Compare and contrast the characteristics of different groups of nonvascular plants

CO3.Summarise and explain the diversity among non-vascular plants the important features, evaluate and appreciate their economic value and their significance in nature.

II. Theory Syllabus:

Unit-1: Introduction to Algae **8Hrs.**

General Characteristics of algae: Occurrence and distribution, cell structure, pigments, flagella and reserve food material. and **reproduction**

1.Classification of algae: F.E. Fritsch (1935) and Lee (2008)

2.Thallus organization and life cycles in algae.

3.Ecological and economic importance of algae.

Unit-2: Biology of selected Algae 10Hrs.

1. Occurrence, structure, reproduction and life cycle of:

2. Chlorophyceae: *Spirogyra* (b) Phaeophyceae: *Ectocarpus*

(c) Xanthophyceae: *Vaucheria* (d) Rhodophyceae:*Polysiphonia*

3.A brief account of Bacillariophyceae

4.Culture and cultivation of *Chlorella* **its significance / economic importance**

Unit-3: Introduction to Fungi 8Hrs.

1.General characteristics of fungi and Ainsworth (1973) classification.

2.Thallus organization and nutrition in fungi.

3.Reproduction in fungi (asexual and sexual); Heterothallism and parasexuality.

4.Ecological and economic importance of fungi.

Unit-4: Biology of selected Fungi 10Hrs.

1.Occurrence, structure, reproduction and life cycle of:

(a) Mastigomycotina: *Phytophthora* (b) Zygomycotina: *Rhizopus*

(c) Ascomycotina: *Penicillium* (d) Basidiomycotina: *Puccinia*

2.Occurrence, structure and reproduction of lichens; ecological and economic importance of lichens. **Types -crustose ,foliose & Fruiticose**

Unit-5: Biology of Bryophytes 9Hrs.

1.General characteristics of Bryophytes; Rothmaler (1951) classification.

2.Occurrence, morphology, anatomy, reproduction (developmental details are not needed) and life cycle of

(a) Hepaticopsida: *Marchantia* (b) Anthoceratopsida: *Anthoceros*

(c) Bryopsida: *Funaria*

3.General account on evolution of sporophytes in Bryophyta.

IV.Text Books:

1.Pandey, B.P. (2013) College Botany, Volume-I, S. Chand Publishing, New Delhi

2.Hait,G., K.Bhattacharya & A.K.Ghosh (2011) A Text Book of Botany, Volume-I, New Central Book Agency Pvt. Ltd., Kolkata

V.Reference Books:

1.Fritsch, F.E. (1945) The Structure¬& Reproduction of Algae (Vol. I & Vol. II) Cambridge University Press Cambridge, U.K.

2.Bold, H.C.& M. J. Wynne (1984) Introduction to the Algae, Prentice-Hall Inc., New Jersey

3.Robert Edward Lee (2008) Phycology. Cambridge University Press, New York

4.Van Den Hoek, C., D.G.Mann & H.M.Jahns (1996)Algae : An Introduction to Phycology. Cambridge University Press, New York.

5.Alexopoulos, C.J., C.W.Mims & M.Blackwell (2007) Introductory Mycology, Wiley& Sons, Inc., New York

6 . Mehrotra, R.S.& K. R. Aneja (1990) An Introduction to Mycology. New Age International Publishers, New Delhi.

7.Kevin Kavanagh (2005) Fungi; Biology and Applications John Wiley& Sons, Ltd., West Sussex, England.

8.John Webster & R. W. S. Weber (2007) Introduction to Fungi, Cambridge University Press, New York.

9.Shaw, A.J.& B. Goffinet (2000) Bryophyte Biology. Cambridge University Press, New York

B.Sc. (HONOURS) MAJOR- BOTANY II SEMESTER

PAPER IV Course title : Origin of Life and Diversity of Microbes

Course code: H401-2

Course 4: SYLLABUS

Credits -3 4 Hrs /week

I. **Learning Outcomes:** By the end of this course the learner will be able:

CO1.Understand and Illustrate the diversity of microbial organisms

CO2.Discuss the general characteristics, classification and explain the structure, nutrition, reproduction and significance of microbes and analyse the interactions among soil microbes.

CO3.Evaluate the importance of microbes and compile their applications in nature and agriculture .

II. Syllabus of Theory:

Unit-1: Origin of life and Viruses **10 Hrs.**

1.Origin of life, concept of primary Abiogenesis; Miller and Urey experiment.; discovery of microorganisms, Pasteur experiments, germ theory of diseases.

2.Five kingdom classification of R.H. Whittaker **Carl Woose Three Domain system**

3.Shape and symmetry of viruses; structure of TMV **and** . Bacteriophage , **Brief classification of viruses**

1. Multiplication of TMV; A brief account of prions, viroids and virusoids; Transmission of plant viruses and their control.
2. Significance of viruses in vaccine production, bio-pesticides and as cloning vectors.

Unit-2: Special groups of Bacteria 7 Hrs.

1. General characteristics, outline classification and economic importance of following special groups of bacteria:

a) Archaebacteria b) Actinomycetes c) Mycoplasma

d) Phytoplasma e) Cyanobacteria

2.Culture and cultivation of *Spirulina and its* **economic importance**

Unit-3: Eubacteria 8 Hrs.

1.Occurrence, distribution and cell structure of eubacteria. shapes

2. Classification of Eubacteria based on nutrition.

3. Reproduction- Asexual (Binary fission and endospores) and bacterial recombination (Conjugation, Transformation, Transduction).
4. Economic importance of Eu-bacteria with reference to their role in Agriculture and industry (fermentation and medicine).

Unit-4: Soil microbes – interactions 10Hrs.

1. Distribution of soil microorganisms in soil.
2. Factors influencing the soil microflora - Role of microorganisms in soil fertility.
3. Interactions among microorganisms, mutualism, comensalism, competition, amensalism, parasitism, **antagonism**

4.Microorganisms of rhizosphere, phyllosphere and spermosphere; microbial interactions and their effect on plant growth.

Unit-5: Microbes in agriculture 10 Hrs.

1.Mass production, mode of applications, advantages and limitations of bacterial inoculants (*Rhizobium, Azotobacter, Azospirillum*, Cyanobacteria).

2.Role of Frankia and VAM in soil fertility.

3.Microbial biopesticides: mode of action, factors influencing, target pests; microbial herbicides.

III. Text Books:

1.Bhattacharjee, R.N., (2017) Introduction to Microbiology and Microbial Diversity, Kalyani Publishers, New Delhi.

2.Dubey, R.C. & D. K. Maheswari (2013) A Text Book of Microbiology, S.Chand & Company Ltd., New Delhi

3.Toshniwal, R.L. (2007) Agricultural Microbiology, Agrobios (India), Jodhpur

IV. Reference Books:

1,Pelczar Jr., M.J., E.C.N. Chan & N. R. Krieg (2001) Microbiology, Tata McGraw- Hill Co, New Delhi

2.Presscott, L. Harley, J. and Klein, D. (2005) Microbiology, Tata McGraw –Hill Co. New Delhi.

3.Gyaneshwar, A.D., G.J. Parekh, and V.S. Reddy (2004) Agricultural Microbiology: Plant-Soil Interactions, Research Signpost, Kerala, India

4.Zaki A. Shuler and Zainul Abid (2014) Agricultural Microbiology: Principles and Applications, CRC Press, Boca Raton, Florida, US

GOVERNMENT COLLEGE FOR WOMEN (A) GUNTUR
DEPARTMENT OF BOTANY
Semester IV /Botany Core Course - 5
VASCULAR PLANTS

(Total hours of teaching –60 @04 Hrs./Week)

I. Learning Objectives: By the end of this course the learner has:

1. To recognize the morphology, anatomy and reproduction in two groups of archegoniates.
2. To acquire knowledge of the taxonomic aids and classification systems.
3. To read the vegetative and floral characteristics of some forms of angiospermic families along with their economic value.
4. To study the significance of other branches of botany in relation to plant taxonomy.

II. Learning outcomes:

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

CO1 (Bloom's Taxonomy Levels 1 and 2 Understand and Analyse): Students will understand and analyse the morphology, anatomy, and reproduction in two groups of archegoniate, demonstrating comprehension of their structures and reproductive strategies within the context of plant taxonomy.

CO2 (**Bloom's Taxonomy Levels 3 and 4 Apply and Evaluate)**: Students will apply their knowledge of taxonomic aids and classification systems to classify various Angiospermic families, reading and interpreting their vegetative and floral characteristics, and evaluating their economic value.

CO3(Bloom's Taxonomy Levels 5 and 6 Create and Synthesize): Students will synthesize knowledge from different branches of botany to create a comprehensive classification framework, illustrating the interrelationship between plant taxonomy and other botanical disciplines, and assessing the significance of these relationships in practical applications.

SYLLABUS

Unit-1: Pteridophytes **10Hrs.**

1.General characteristics of Pteridophytes; Smith (1955) classification.

2.Occurrence, morphology, anatomy, reproduction (developmental details are not needed and life history of: (a) Lycopsida:*Lycopodium* and (b) Filicopsida: *Marsilea*

3.Stelar evolution in Pteridophytes; Heterospory and seed habit

4.Ecological and economic importance of Pteridophytes.

Unit-2: Gymnosperms 10Hrs.

1. General characteristics of Gymnosperms; Sporne (1965) classification.
2. Occurrence, morphology, anatomy, reproduction (developmental details are not needed) and life history of:(a) Cycadopsida: *Cycas* and (b) Gnetopsida: *Gnetum*
3. Ecological and economic importance of Gymnosperms.
4. Geological time Scale

Unit-3: Principles of Plant Taxonomy 10 Hrs.

1. Aim and scope of taxonomy, species concept, taxonomic hierarchy-major and minor categories.
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. Phylogenetic systematics: primitive and advanced, homology and analogy, parallelism and convergence, monophyly, paraphyly, polyphyly, clades. synapomorphy, symplesiomorphy, apomorphy. APG-IV classification.

Unit-4: Descriptive Plant Taxonomy 8 Hrs.

Systematic description and economic importance of the following families:

1.Polypetalae: (a) Annonaceae (b) Cucurbitaceae
2.Gamopetalae: (a) Asteraceae (b) Asclepiadaceae
3.Monochlamydae: (a) Amaranthaceae (b) Euphorbiaceae
4.Monocotyledonae: (a) Arecaceae (b) Poaceae

Unit-5: Evidences for Plant systematics 7Hrs.

1. Anatomy and embryology in relation to plant systematics.
2. Cytology and cytogenetics in relation to plant systematics.
3. Phytochemistry in relation to plant systematics.
4. Numerical taxonomy, Chemotaxonmy in brief
5. Origin and evolution of angiosperms.

I. Text Books:

1. Acharya, B.C., (2019) Archegoniates, Kalyani Publishers, New Delhi
2. Bhattacharya, K., G. Hait&Ghosh, A. K., (2011) A Text Book of Botany, Volume II, New Central Book Agency Pvt. Ltd., Kolkata
3. Hait,G., K.Bhattacharya&A.K.Ghosh (2011) A Text Book of Botany, Volume-I, New Central Book Agency Pvt. Ltd., Kolkata
4. Pandey, B.P. (2013) College Botany, Volumes-I&II, S. Chand Publishing, New Delhi

II. Reference Books:

1. Smith, G.M. (1971) Cryptogamic Botany Vol. II., Tata McGraw Hill, New Delhi
2. Sharama's.(2012) Pteridophytes. Tata McGraw-Hill, New Delhi
3. Sporne, K.R. (1971) The Morphology of Gymnosperms.Hutchinsons Co. Ltd., London
4. Coulter, J.M. & C.J.Chamberlain (1910) Morphology of Gymnosperms, The University of Chicago Press, Chicago, Illinois
5. Bhatnagar, S.P. &Alok Moitra (1996) Gymnosperms. New Age International, New Delhi
6. Samba Murty, A.V.S.S. (2005) Taxonomy of Angiosperms I. K .International Vt. Ltd., New Delhi
7. Singh, G. (2012). Plant Systematics: Theory and Practice. Oxford& IBH Pvt.Ltd., New Delhi.
8. Simpson, M.G. (2006). Plant Systematics. Elsevier Academic Press, San Diego, CA,U.S.

GOVERNMENT COLLEGE FOR WOMEN (A) GUNTUR

DEPARTMENT OF BOTANY

Botany Major: III Semester

Course 5 : Vascular Plants

(Pteridophytes, Gymnosperms and Angiosperm Taxonomy)

Practical 02 hours /Week Credits -1

Course Outcomes: On successful completion of this practical course, student shall be able to:

1.Distinguish the Pteridophytes and Gymnosperms based on their morphological, anatomical and reproductive structures.

2.Make systematic classification of plant species using vegetative and floral characters.

3.Identify angiosperm plant species and make herbarium specimens.

II Laboratory/field exercises:

I Study/ microscopic observation of vegetative, sectional/anatomical and reproductive structures of the following using temporary or permanent slides/specimens/ mounts:

1.Pteridophyta: Lycopodium and Marselia

2.Gymnosperms: Cycas and Gnetum

10

II. Technical description of locally available plant species from the following angiosperm families:

1. Annonacae 2. Cucurbitaceae 3. Asteraceae 4. Asclepiadaceae

5.Amaranthaceae 6. Euphorbiaceae 7. Arecaceae 8. Poaceae

10

III. Demonstration of herbarium techniques.

10

IV. Field trip to a local floristic area/forest (Submission of 30 number of Herbarium sheets of wild plants with the standard system are mandatory). 5

V. RECORD+FIELD NOTE BOOK + VIVA 5+5+5 15

GOVERNMENT COLLEGE FOR WOMEN (A) GUNTUR

DEPARTMENT OF BOTANY

Semester IV /Botany Core Course - 6

Plant Pathology and Plant Diseases

(Total hours of teaching –60 @04 Hrs./Week) Credits -3

Max Marks :60 Total No. of Hours : 60

I. Learning Objectives: By the end of this course the learner has:

1. To study various plant pathogens, their survival and dispersal mechanisms.
2. To understand the processes involved in infection and pathogenesis in plants.
3. To study the common diseases of some important field and horticultural crops.

II. Learning Outcomes:

CO1-Identify major groups of plant pathogens and classify plant diseases and compare stages in infection, plant pathogenesis and responsible factors.

CO2-Apply the different types of preventive and control measures for plant diseases.

CO3-Evaluate some diseases of field crops and horticultural crops and their management.

III. Syllabus of Theory:

Unit-1: Plant pathogens, survival and dispersal **8 Hrs.**

1. Plant pathology: definition, importance of plant diseases, important famines in world; scope and objectives of plant pathology.
2. Important plant pathogenic organisms with examples of diseases caused by them.
3. Classification of plant diseases based on important criteria.
4. A brief account on survival of plant pathogens.
5. Dispersal of plant pathogens – active and passive processes.

Unit-2: Infection and pathogenesis in plants 8 Hrs.

1. Infection process – pre-penetration, penetration and post-penetration.
2. Role of enzymes in plant pathogenesis.
3. Role of toxins in plant pathogenesis.
4. Role of growth regulators in plant pathogenesis.
5. Defense mechanisms in plants against pathogens.

Unit-3: Plant disease management 8 Hrs.

1. Plant disease epidemiology; plant disease forecasting; remote sensing in plant pathology.
2. General principles of plant diseases management.
3. Regulatory methods, cultural methods; biological control and PGPR.

4. Physical methods, chemical methods; host plant resistance.

5, Integrated plant disease management (IDM) – Concept, advantages and importance

Unit-4: Diseases of field crops 12 Hrs.

Symptoms, etiology, disease cycle and management of major diseases of following crops:

a) Rice: Blast of rice and bacterial blight

b) Bajra: Downy mildew and Ergot

c) Cotton : Angular leaf spot and wilt

d) Groundnut: Tikka leaf spot and root rot

Unit-5: Diseases of horticultural crops 9 Hrs.

Symptoms, etiology, disease cycle and management of major diseases of following crops:

a) Brinjal: Phomopsis blight and Little leaf

b) Okra: Powdery mildew and Yellow vein mosaic

c) Pomegranate: Alternaria fruit spot and Anthracnose

d) Mirchi : Anthacnose and fruit rot, powdery mildew

IV. Text Books:

1. P.D. Sharma (2011) Fundamentals of Plant Pathology, Tata McGraw-Hill Education, New Delhi
2. R.S. Singh and U.S. Singh (2017) Plant Pathology: An Introduction, CRC Press, Boca Raton, Florida, USA
3. R.S. Mehrotra (2008) Plant Pathology, Tata McGraw-Hill Education, New Delhi
4. M. S. Reddy and Gopal Singh (2016) Plant Pathology: Concepts and Laboratory Exercises, Scientific Publishers, Jodhpur, India

V. Reference Books:

1. Agrios, G. N. (2005). Plant Pathology (5th ed.). Academic Press, San Diego, California.
2. Dehne, H. W. (Ed.). (2012). Plant Pathology: From Molecular Biology to Biological Control. Springer, Dordrecht, Netherlands.
3. Dicklow, M. B., & Beaudry, R. M. (Eds.). (2013). Plant Pathology Concepts and Laboratory Exercises (2nd ed.). CRC Press, Boca Raton, Florida.
4. Lucas, J. A. (1998). Plant Pathology and Plant Pathogens. Blackwell Science, Oxford, UK.
5. Lucas, J. A. (1998). Plant pathology and plant pathogens. Blackwell Science, Oxford, UK.
6. Schumann, G. L., & D'Arcy, C. J. (2010). Essential Plant Pathology (2nd ed.). APS Press, St. Paul, Minnesota.
7. Schumann, G. L., and C. D'Arcy (2010). Essential plant pathology. APS Press, St. Paul, MN.
8. Singh, R. P., and U. S. Singh (2020). Plant diseases: Identification, management and challenges. Springer, Singapore.

Botany Major: III Semester

Course 6 : Plant Pathology and Plant Diseases

Practical

02 hours /Week Credits -1

I. Course Outcomes: On successful completion of this practical course, student shall be able to:

1. Handle equipment and instruments in plant pathology laboratory.
2. Isolate plant pathogenic microbes.
2. Identify the plant diseases based of histopathological observations.

II. Laboratory/field exercises:

1. Familiarity with general plant pathological laboratory and field equipment.
2. Isolation and Identification of plant pathogenic fungi.
3. Isolation and Identification of plant pathogenic bacteria.
4. Identification of phanerogamic plant parasites.
5. Isolation and Identification of plant pathogenic nematodes.
6. Demonstration of Koch's postulates
7. Identification and histopathological studies of selected diseases of field crops.
8. Identification and histopathological studies of selected diseases of horticultural crops.

GOVERNMENT COLLEGE FOR WOMEN (A) GUNTUR
DEPARTMENT OF BOTANY

Semester IV /Botany Core Course - 7

Plant Breeding

(Total hours of teaching –60 @04 Hrs./Week) Credits -3

Max Marks :60 Total No. of Hours :

I. Learning Objectives: By the end of this course the learner has:

1. To learn the objectives and scope of plant breeding along with reproductive methods in plants.
2. To understand the breeding methods in plant for production of new varieties.
3. To have a comprehensive knowledge on tools and techniques in plant breeding.

II.Course out comes:

CO1-Outline and Explain Plant reproduction methods, self-incompatibility, Breeding methods and Modern methods.

CO2-.Apply and Analyze advantages and disadvantages of different reproduction methods, male sterility, domestication and different breeding methods.

CO3-Discuss and justify genetic consequences and significance of pollination, male sterility, breeding methods for self and cross pollination plants.

SYLLABUS

Unit-1: Basic concepts of plant breeding **8 Hrs.**

1. Definition, aim, objectives and scope of plant breeding; concepts in plant breeding: genetic variation, heritability, and selection.
2. Advantages and disadvantages of asexual and sexual reproduction; apomixis: definition, types and significance.
3. A brief account of self and cross-pollination, their genetic consequences and significance; classification of crop plants based on mode of pollination and mode of reproduction.

Unit-2: Contrivances for cross pollination 7 Hrs.

1. Self-incompatibility in plants – Definition, heteromorphic and homomorphic systems; exploitation of self-incompatibility in hybrid production.
2. Male sterility- Genetic, cytoplasmic and cytoplasmic-genetic, utilization in plant breeding.
3. Domestication of plants, centres of origin of crop plants.

Unit-3: Breeding methods in plants 9 Hrs.

1. Plant introduction – types, objectives, plant introduction agencies in India, procedure, merits and demerits; germplasm collections, genetic erosion, gene sanctuaries.
2. Selection – natural and artificial selection – basic principles of selection.

3. Self-pollinated crops: pure line selection method – procedure, advantages and disadvantages, achievements.
4. Vegetatively propagated crops: Clonal selection - procedure, advantages and disadvantages, achievements.

Unit-4: Breeding methods in cross-pollinated plants 12 Hrs.

1. Hybridization – objectives, types, procedure, advantages and disadvantages, achievements.
2. Cross-pollinated crops: back cross method - procedure, advantages and disadvantages, achievements.
3. Heterosis: definition, genetic bases of heterosis – dominance, over dominance and epistasis hypotheses; physiological bases of heterosis – commercial utilization.
4. Synthetics and composites – production procedures – merits, demerits and achievements.

Unit-5: Modern methods in plant breeding 9 Hrs.

1. Mutation breeding: spontaneous and induced mutations – characteristic features of mutations – procedure of mutation breeding – applications – advantages, limitations and achievements.
2. Polyploidy breeding: auto-polyploids and allopolyploids – applications in crop improvement and limitations.
3. DNA markers and their applications in plant breeding: RFLP, SSR, and SNP
4. Marker Assisted Selection (MAS) and its applications in plant breeding.

II. Text Books:

1. Singh, B. D. (2001) Plant breeding: Principles and methods. Kalyani Publishers, New Delhi, India.
2. Poehlman, J. M. and Sleper, D. A. (1995) Breeding field crops, 4th ed. Iowa State University Press, Ames, Iowa, USA.
3. Patil, J.V., S.S. Patil, and R.A. Balikai (2019) Principles and Methods in Plant Breeding, Scientific Publishers (India), Jodhpur
4. Purohit, S.S. (2014) Plant Breeding: Principles and Methods, Agrobios (India), Jodhpur

III. Reference Books:

1. Acquaah, G. 2012. Principles of plant genetics and breeding, 2nd ed. Wiley-Blackwell, Ames, Iowa, USA.
2. Allard, R. W. 1999. Principles of plant breeding. John Wiley & Sons, New York, USA.
3. Stuber, C. W., Edwards, M. D. and Wendel, J. F. 1987. Molecular markers in plant breeding: Applications and potential. Science 238: 1659-1664.
4. Hayes, H. K., R. E. Kirk, and R. H. Jones (1951). Methods for the Statistical Analysis of Plant Breeding Experiments. Iowa State College Press, Ames, IA.
5. Simmonds, N. W. (1979). Principles of Crop Improvement (2nd ed.). Longman, Harlow, UK.

III Semester Botany

Course 7: Plant Breeding PRACTICAL

CREDITS 1

I. Course Outcomes: On successful completion of this practical course, student shall be able to:

1. Distinguish self and cross-pollinated plant species based on floral biology.
2. Perform skills related to self and cross pollination in plants.
3. Make hybridization to produce new varieties.

II. Laboratory/field exercises:

1. Floral biology in a self and a cross pollinated plant species.
2. Identification and classification of plants based on pollination mechanism.
3. Pollen viability test.
4. Observation on pollen germination.
5. Practicing emasculation technique.
6. Practicing selfing and crossing techniques.

GOVERNMENT COLLEGE FOR WOMEN (A) GUNTUR

DEPARTMENT OF BOTANY

Semester III /Botany Core Course – 8

Course code H401-8

PLANT BIOTECHNOLOGY

(Total hours of teaching –60 @04 Hrs./Week) Credits -3

I. Learning Objectives: By the end of this course the learner has:

1. To acquire knowledge of sterilization techniques used in plant tissue culture.
2. To learn about various types of plant tissue culture practices.
3. To know the applications of plant biotechnology in production of novel plants.

II.Learning Outcomes: Students at the successful completion of the course will be able to:

CO1 -(Bloom's Taxonomy Levels 1 and 2):

Demonstrate knowledge and understanding of basic terminology, concepts, principles of plant tissue culture and explain the scientific techniques and tools used in plant tissue culture laboratory.

CO2 - (Bloom's Taxonomy Levels 3 and 4):

Apply advanced concepts, theories, and analyze the complex organization, developmental process and Acquire skills related to various aspects in plant tissue culture and Appraise the applications of plant tissue culture in agriculture and horticulture sectors

CO3- (Bloom's Taxonomy Levels 4 and 5):

and phytoremediation.and Judge the biosafety and bioethics related to plant biotechnology Evaluate the role of transgenic plants in solving certain plant related beneficiary issues and production of secondary metabolites and Justify the role of plant biotechnology in bioenergy

III.Syllabus of Theory:

UNIT-1: Basic techniques in plant tissue culture **10 Hrs.**

1.Plant tissue culture: Definition, scope and significance; infrastructure and equipment required to establish a tissue culture laboratory

2.Sterilization techniques; formulation of media for plant tissue culture **Different types of media in brief**

3.Concept of. totipotency, initiation and maintenance of callus cultures; induction of morphogenesis in vitro.

4.Somatic embryogenesis and organogenesis; factors affecting somatic embryogenesis and organogenesis synthetic seeds and their applications.

UNIT-2: Organ and haploid culture techniques ***8 Hrs.***

1.Importance and applications of meristem culture, zygotic embryo culture, endosperm culture.

2.Micropropagation and its uses, commercial exploitation of micropropagation.

3.Production of haploids using anther, pollen and unfertilized ovule cultures - characterization and applications.

UNIT-3: Cell and protoplast cultures **12 Hrs**.

1. Cell suspensions – continuous and batch cultures; mass cultivation of plant cells using bioreactors.
2. Production of secondary metabolites from cell cultures, strategies used for enhanced production of Secondary metabolites. Biotransformation using plant cell cultures.

3.Isolation, purification and culture of protoplasts; methods used for protoplast fusion.

4.Somatic hybridization/cybridization –selection systems for somatic hybrids/cybrids, their characterization and applications.

UNIT-4: Transgenic plants *8 Hrs.*

1.Transgenic plants – definition, biosafety and ethical issues associated with transgenic plants.

2.Herbicide resistance (glyphosphate), insect resistance (alpha amylase inhibitor**). Bt Cotton and Roundup Ready Soya Bean.**

3.Virus resistance (coat protein mediated, nucleocapsid gene), disease resistance (antifungal proteins, PR proteins). CRISPR

4.Quality improvement (Golden rice), Shelf-life enhancement (Flavr savr tomato). **Improved horticultural varieties (Moon dust carnations)**

UNIT-5: Advances in plant biotechnology *7 Hrs.*

1.Plant synthetic biology and its applications; plant-based vaccines and therapeutics.

2.Biofortification and genetically modified foods.

3.Biodegradable plastics, polyhydroxybutyrate.

4.Applications of plant biotechnology in bioenergy production and environmental remediation.

III. Text Books:

1. Ignacimuthu , S., (2003) Plant Biotechnology. Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi.
2. Kalyan Kumar De., (1997) Plant Tissue Culture – New Central Book Agency (P) Ltd., Calcutta.
3. Mascarenhas A.F., (1991) Hand book of Plant Tissue Culture.ICAR New Delhi.
4. Narayanaswamy, S (1994) Plant Cell and Tissue Culture, Tata –Mc Graw Hill Publishing Co., Ltd., New Delhi.

IV. *Reference Books:*

1. C. Neal Stewart Jr. (2018) Plant Biotechnology and Genetics: Principles, Techniques, and Applications John Wiley & Sons, Inc. in Hoboken, New Jersey, USA.

2. Adrian Slater, Nigel W. Scott, and Mark R. Fowler (2008) Plant Biotechnology: The Genetic Manipulation of Plants Oxford University Press in Oxford, UK.

3.S. Mohan Jain and Pramod K. Gupta (2010) Plant Biotechnology: Methods and Applications CRC Press, Taylor & Francis Group in Boca Raton, Florida, USA.

4. Ram Lakhan Singh (2017) Plant Biotechnology: Recent Advances and Future Prospects Springer International Publishing AG in Cham, Switzerland.

5. Altman and P.M. Hasegawa (2013) Plant Biotechnology and Agriculture: Prospects for the 21st Century Elsevier Inc. in Amsterdam, Netherlands.

GOVERNMENT COLLEGE FOR WOMEN (A) GUNTUR

DEPARTMENT OF BOTANY

Semester III /Botany Core Course – 8

PLANT BIOTECHNOLOGY

PRACTICAL SYLLABUS

Course code H401-8 practical **Credits -1**

Course Outcomes: On successful completion of this practical course, student shall be able to:

1. Operate all the equipment and instruments in a plant tissue culture laboratory.
2. Establish callus and organ culture.
3. Obtain quality plants using micro-propagation techniques.

II. Laboratory/field exercises:

1. Equipment used in plant tissue culture.

2. Sterilization techniques in plant tissue culture laboratory.

3. Preparation of culture media

4. Callus induction and subculturing.

5. Organogenesis using PGRs'

6. Demonstration of cell and protoplast culture.

7. Demonstration of organ cultures.

8. Demonstration of anther and pollen cultures.

GOVERNMENT COLLEGE FOR WOMEN (A) GUNTUR

DEPARTMENT OF BOTANY

Semester IV /Botany Core Course -

(Total hours of teaching –60 @04 Hrs./Week)

Course 9: Anatomy and Embryology of Angiosperms

Credits -3

I. Learning Objectives: By the end of this course the learner has:

1. To know about various types of tissues in plants and their organization.
2. To obtain awareness on anomalous secondary growth in plants and economic value of woods.
3. To acquire knowledge on development of male and female gametophytes in plants.
4. To probe into embryogenesis in angiosperms.

II. Learning Outcomes: On completion of this course students will be able to:.

Course Outcome 1 (Bloom's Taxonomy Levels 1 and 2):

- Demonstrate knowledge and understanding of basic terminology, concepts, principles, and interrelationships in plant anatomy and embryology.

Course Outcome 2 (Bloom's Taxonomy Levels 3 and 4):

- Apply advanced concepts, theories, and analyze the complex organization, developmental process and adaptations to environment in the field of plant anatomy and embryology,

Course Outcome 3 (Bloom's Taxonomy Levels 4 and 5):

Utilize critical thinking, creativity, and research skills to evaluate the role of various tissues in plants. justify the value of timber plants and Summarize the events in developmental and reproductive biology in plants..

III. Syllabus of Theory:

Unit – 1: Tissues in plants **8 Hrs.**

1. Meristematic tissues: Definition, classification, structure and functions.
2. Apical meristems: Generalised structure of shoot apex, theories on organization of Shoot Apical Meristem (SAM) - Apical cell theory, Tunica-Corpus theory and Histogen theory.
3. Permanent tissues (simple and complex).
4. A brief account of plant secretory tissues/cells.

Unit-2: Anomalous growth in plants 10Hrs.

1. Tissue systems–Epidermal, ground and vascular.
2. Anomalous secondary growth in root of *Beta vulgaris*
3. Anomalous secondary growth in stems of *Boerhaavia* and *Dracaena*

4. Study of timbers of economic importance - Teak, Red-sanders and Rosewood.
5. Applications of anatomy in plant systematics, forensics and pharmacognosy.

Unit-3: Anther and pollen 10Hrs.

1. Anther: Structure and functions of anther wall, micro-sporogenesis, callose deposition and its significance.
2. Pollen wall structure, MGU (male germ unit) structure, NPC system; a brief account of Palynology and its scope; development of male gametophyte.
3. Pollen wall proteins; Pollen viability, storage and germination; Abnormal features: pseudomonads, polyads, massulae, pollinia.

Unit-4: Ovules, fertilization and endosperm 10Hrs.

1. Structure and types of ovules, megasporogenesis; monosporic (*Polygonum*), bisporic (*Allium*) and tetrasporic (*Peperomia*) types of embryo sacs.
2. Outlines of pollination; self-incompatibility- basic concepts; methods to overcome self-incompatibility (mixed pollination, bud pollination, stub pollination).
3. Double fertilization in angiosperms – process and consequences.
4. Perisperm; endosperm – types (free nuclear, cellular, helobial and ruminate) and biological importance.

Unit-5: Embryogeny and seeds 7Hrs.

1. Embryogeny in dicot (*Capsella bursa-pastoris*)
2. Embryogeny in monocot (*Sagittariasagittifolia*).
3. Seed structure in monocot and dicot.
4. Importance of seed and seed dispersal mechanisms.
5. Polyembryony and apomixes: Introduction, classification, causes and application

GOVERNMENT COLLEGE FOR WOMEN (A), GUNTUR

II B.Sc ,IV Semester Botany Major

Course 10: Plant Ecology, Biodiversity and Phytogeography

Credits -3

I. Learning Objectives: By the end of this course the learner has:

1. To figure-out the components of ecosystem and energy flow among different trophic levels.
2. To apprise the characteristics of autecology and synecology.
3. To understand the climatic change and associated impacts on biotic components.
4. To discern the value of biodiversity, threats and conservation strategies.
5. To know the distribution of various plant groups in different geographical areas.

II. Learning Outcomes: On completion of this course students will be able to:

Course Outcome 1 (Bloom's Taxonomy Levels 1 and 2):

Demonstrate knowledge and understanding of basic terminology, concepts, principles, and interrelationships in ecology, and biodiversity. Explain the interactions among the biotic and abiotic components in an ecosystem

Course Outcome 2 (Bloom's Taxonomy Levels 3 and 4):

Apply knowledge of advanced concepts, theories, to analyze energy flow, population and community. characteristics of , and environmental issues. Assess biodiversity threats and conservation efforts, and explain the distribution of plant species across different regions.

Course Outcome 3 (Bloom's Taxonomy Levels 4 and 5):

Utilize critical thinking, creativity, and research skills to investigate and propose innovative solutions in, ecology, and biodiversity. (Anticipate the problems arising due to climate change. Evaluate the value of biodiversity, justify the principles of conservation using IUCN threat-categories. Create and suggest strategies for conservation of biodiversity considering the roles of NBPGR and NBA.)

III. Syllabus of Theory:

Unit-1: Basic concepts in ecology **10 Hrs.**

1. Ecology: definition, branches and significance; relation with other sciences.
2. Structure and functions of ecosystems- abiotic and biotic components; flow of energy.
3. Cycling of materials: water, carbon, nitrogen and phosphorus; trophic pyramids, food chains and food webs.
4. Plants and environment: Climatic (light and temperature) and edaphic.
5. Interactions among plants; interactions between plants and animals.

Unit-2: Population and community ecology 10Hrs.

1. Population ecology: definition, characteristics -natality, mortality, growth curves, ecotypes, ecads.
2. Community ecology: characteristics -frequency, density, cover, life forms, competition, biological spectrum.
3. Ecological succession: Hydrosere and Xerosere.
4. Concepts of productivity: GPP, NPP and Community Respiration
5. Secondary production, P/R ratio and Ecosystems.

Unit-3: Climate change-impacts 8Hrs.

1. Soil degradation – causes, consequences and management strategies.
2. Deforestation, forest fires – causes, consequences and management strategies.
3. Global warming, ozone layer depletion, acid rains, ocean acidification – causes and effects.
4. Carbon foot prints and carbon credits; The Montreal and the Kyoto protocol.
5. Plant indicators and their role in environmental monitoring.

Unit-4: Concepts of Biodiversity 10Hrs

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

Unit-5: Phytogeography 7 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.

IV. Text Books:

1. Pandey, B.P. (2013) College Botany, Volumes- II & III, S. Chand Publishing, New Delhi
2. Bhattacharya, K., G. Hait & Ghosh, A. K., (2011) A Text Book of Botany, VolumeII, New Central Book Agency Pvt. Ltd., Kolkata
3. N.S.Subrahmanyam& A.V.S.S. Sambamurty (2008) Ecology Narosa Publishing House, New Delhi
4. Sharma, P.D. (2012) Ecology and Environment. Rastogi Publications, Meerut, India.
5. U. Kumar (2007) Biodiversity: Principles & Conservation, Agrobios (India),
6. Mani, M.S (1974) Ecology & Biogeography of India Dr. W. Junk Publishers, The Hague Jodhpur

V. Reference Books:

1. Kormondy, Edward J. (1996) Concepts of Ecology,Prentice-Hall of India Private Limited, New Delhi
2. Begon, M., J.L. Harper & C.R. Townsend (2003) Ecology, Blackwell Science Ltd., U.S.A.
3. Eugene P. Odum (1996) Fundamentals of Ecology, Natraj Publishers, Dehradun
4. Kumar, H.D. (1992) Modern Concepts of Ecology (7th Edn.,)Vikas Publishing Co.,New Delhi.
5. Newman, E.I. (2000): Applied Ecology Blackwell Scientific Publisher, U.K.
6. Chapman, J.L&M.J. Reiss (1992): Ecology - Principles & Applications. Cambridge University Press,
7. Kumar H.D. (2000) Biodiversity & Sustainable Conservation Oxford & IBH Publishing Co Ltd. Delhi.
8. Good, R. (1997) The Geography of flowering Plants (2nd Edn.) Longmans, Green & Co., Inc.,& Allied Science Publishers, New Delh

GOVERNMENT COLLEGE FOR WOMEN (A), GUNTUR

II B.Sc-SEMESTER-IV

Course 11: Plant Resources and Utilization

Credits -3

I. Learning Objectives: By the end of this course the learner has:

1. To know different plants domesticated by humans and utility of their products.
2. To gain knowledge on commercial and timber products obtained from plants.
3. To know the facts on economic value of plants products in relation to human welfare.

II. Learning Outcomes: Students at the successful completion of the course will be able to:

1. Explain and list out the significance of plants in human nutrition, different plant products used by human beings
2. Apply and analyze the uses of medicinal and aromatic plants for human health care .and importance of timber and non-timber products for value added products.
3. Evaluate the commercial plants and energy products and their utilization

I. Syllabus of Theory:

UNIT-1: Food plants **10 Hrs.**

1. Centres of diversity of plants, origin of crop plants.
2. Domestication and introduction of crop plants; concepts of sustainable development.
3. Cultivation, production, and uses of cereals (rice and wheat), major (jowar and bajra) and minor millets (finger millet, fox tail millet), pulse crops (red gram and black gram) and sugarcane.

UNIT-2: Other economic plant products 8 Hrs.

1. A general account of oil seed crops and vegetable oils.
2. A general account of fruit and vegetable yielding plants.
3. Plant sources and economic importance of rubber, latex, gums, resins, dyes, alkaloids and tannins.
4. A general account of major fibre crops in India; textile production from plant fibres.

UNIT-3: Commercial plant products 8 Hrs.

1. A general account and economic potential of spices and condiments.
2. Plant sources and economic importance of flavouring products, beverages, fumitories and masticatories and narcotics.
3. Utilization of some important ornamentals, flowering plants and orchids.

UNIT-4: Medicinal and aromatic plant products 10 Hrs.

1. Traditional and modern uses of some medicinal plants of India.
2. Active compounds in medicinal plants and their pharmacological effects.
3. Essential oils and their uses; aromatic plants in perfumery and cosmetics.
4. Phytochemicals and their potential health benefits.

UNIT-5: Timber products and energy crops 9 Hrs.

1. Important timber yielding plants of India; wood as a construction and manufacturing material.
2. Other uses of wood products, such as paper and fuel.
3. Energy crops, biofuels and bioplastics.
4. Bamboos, *Eucalyptus, Casuarina* - generation of paper industry raw material.

II. Textbooks:

1. S. K. Jain and R. A. Jain, (2015) Handbook of Plant Resources, Springer, New York.
2. H. Panda and A. K. Padhi, (2017) Medicinal Plants and Their Utilization, Springer, Singapore.
3. G.E. Wickens (1998) Economic Botany: Principles and Practices, Chapman & Hall, London.
4. S.L. Kochhar (1990) The Economic Botany of the Tropics, Macmillan, London.

III. Reference Books:

1. K. V. Peter, (2004) Handbook of Herbs and Spices, CRC Press, Boca Raton.
2. J. E. Simon, J. A. Duke, and E. A. L. Bobilya, (1990) Handbook of Edible Weeds, CRC Press, Boca Raton.
3. J. Smartt and N. Haq, (2016) Handbook of Industrial Crops, Springer, New York.
4. P. N. Ravindran, (2017) The Encyclopaedia of Herbs and Spices, CABI, Wallingford.
5. Beryl B. Simpson (2010) Economic Botany: Plants in Our World, Academic Press, London.

6. Michael J. Balick and Paul Alan Cox (1996) Plants, People, and Culture: The Science of Ethnobotany, Scientific American Library, New York.
7. Ben-Erik van Wyk (2016) Food Plants of the World: An Illustrated Guide, Timber Press, Portland.
8. Jo Homan (2012) Plants That Changed History, Chartwell Books, New York.
9. Gary J. Martin (2004) Ethnobotany: A Methods Manual, Earthscan Publications, London.

IV Semester

Course 11: Plant Resources and Utilization

Credits -1

I. Course Outcomes: On successful completion of this practical course, student shall be able to:

1. Characterize various plant products based on morphological and microscopic observations.
2. Identify economically valuable plants and their products.
3. Categorize distinct plant products utilized by humans.

II. Laboratory/field exercises:

1. Study of morphology and micro-chemical test for stored material of any 3 food crops.
2. Study of morphology and microscopic study anatomy of some plant fibres (cotton, jute, hemp, ramie, sisal).
3. Study of morphology, medicinal and aromatic plants and their useful parts.
4. Study of some oil yielding crops and properties of their oils.
5. Study of some gum, resin, tannin, dye yielding plants.
6. Study of firewood, biofuel and timber yielding plants.

B.Sc. THREE MAJOR- BOTANY

Semester III /Botany Core Course -3

Anatomy and Embryology of Angiosperms, Plant Ecology and Biodiversity

Course code :BOT401-3

(Total hours of teaching –60 @04 Hrs./Week)

Learning outcomes:

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

Course Outcome 1 (Bloom's Taxonomy Levels 1 and 2):

- Demonstrate knowledge and understanding of basic terminology, concepts, principles, and interrelationships in plant anatomy, embryology, ecology, and biodiversity.

Course Outcome 2 (Bloom's Taxonomy Levels 3 and 4):

- Apply advanced concepts, theories, and analyze the complex organization, developmental process and adaptations to environment in the field of plant anatomy, embryology, ecology, and biodiversity

Course Outcome 3 (Bloom's Taxonomy Levels 4 and 5):

- Utilize critical thinking, creativity, and research skills to investigate and propose innovative solutions in plant anatomy, embryology, ecology, and biodiversity.

Unit–1: Anatomy of Angiosperms 12 Hrs

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

Unit–2: Embryology of Angiosperms 12 Hrs.

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

Unit–3: Basics of Ecology 12 Hrs.

1. Ecology: definition, branches and significance of ecology.
2. Ecosystem: Concept and components, energy flow, food chain, food web, ecological pyramids.

3. Plants and environment: Climatic (light and temperature), edaphic and biotic factors.
4. Ecological succession: Hydrosere and Xerosere.
5. Biogeochemical cycles

Unit–4: Population, Community and Production Ecology 12 Hrs.

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

Unit–5: Basics of Biodiversity 12 Hrs.

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

Textbooks:

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

BooksforReference:

- Esau,K. (1971)*Anatomy of Seed Plants.* John Wiley and Son, USA.
- Paula Rudall (1987)*Anatomy of Flowering Plants: An Introduction to Structure and Development.* Cambridge University Press, London
- Bhojwani,S.S. and S.P.Bhatnagar(2000)*The Embryology of Angiosperms(4th Ed.),*Vikas Publishing House, Delhi.
- Pandey,A.K.(2000)*Introduction to Embryology of Angiosperms*. CBS Publishers & Distributors Pvt.Ltd. , New Delhi
- Maheswari, P.(1971)*An Introduction to Embryology of Angiosperms*. McGrawHillBook Co.,London.
- Kormondy, Edward J. (1996) *Concepts of Ecology,* Prentice-Hall of India Private Limited, NewDelhi
- Eugene P.Odum (1996) *Fundamentals of Ecology,*Natraj Publishers,Dehradun
- Sharma, P.D. (2012) *Ecology and Environment*. Rastogi Publications, Meerut, India.
- Kumar H.D. (2000) *Biodiversity & Sustainable Conservation* Oxford & IBHP publishing Co Ltd. New Delhi.
- U. Kumar (2007) *Biodiversity:Principles&Conservation,*Agrobios(India),Jodhpur

B.Sc. THREE MAJOR- BOTANY

IV Semester/Botany Core Course -4

Plant Physiology and Metabolism

Course code :BOT401-4

Total hours of teaching – 60 @ 04Hrs./Week) credits 3

Learning Outcomes

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

CO 1: Understand the importance of water in plant life and mechanisms for transport of water and solutes in plants, symptoms. Interpret the role of enzymes in plant metabolism

CO 2: Apply and and analyze the role of minerals in plant nutrition and the concepts of biochemical reactions of photosynthesis , respiration, Nitrogen and lipid metabolism.

CO 3: Evaluate the physiological factors that regulate growth and development in plants Summarize the various biochemical reactions and draw cycles

Unit–1: Plant-Water relations 10 Hrs.

1. Importance of water to plant life, physical properties of water, diffusion, imbibition, osmosis.water potential, osmotic potential, pressure potential, plasmolysis
2. Absorption and lateral transport of water; Ascent of sap
3. Transpiration: stomata structure and mechanism of stomatal movements (K^+ influx).
4. Mechanism of phloem transport; source-sink relationships.

Unit–2:Mineral nutrition, Enzymes and Respiration 14 Hrs.

1. Essential macro and micro mineral nutrients and their role in plants; symptoms of mineral deficiency
2. Absorption of mineral ions; passive and active processes.
3. Characteristics, nomenclature and classification of Enzymes. Mechanism of enzyme action, enzyme kinetics.
4. Respiration: Aerobic and Anaerobic; Glycolysis, Krebs cycle; electron transport system, mechanism of oxidative phosphorylation, Pentose Phosphate Pathway(HMP shunt).

Unit–3:Photosynthesis and Photo respiration 12 Hrs.

1. Photosynthesis:Photosynthetic pigments ,absorption and action spectra; Reddrop and

Emerson enhancement effect

2. Concept of two photo systems; mechanism of photosynthetic electron transport and evolution of oxygen; photo phosphorylation

3. Carbon assimilation pathways (C3,C4andCAM)

4. Photorespiration -C2 pathway

Unit–4: Nitrogen and lipid metabolism 12 Hrs.

1. Nitrogen metabolism: Biological nitrogen fixation–asymbiotic and symbiotic nitrogen fixing organisms. Nitrogenase enzyme system.
2. Amino acid synthesis and metabolism (prolene mechanism)
3. Lipid metabolism: Classification of Plant lipids, saturated and unsaturated fatty acids.
4. Anabolism of triglycerides, β-oxidation of fattyacids, Glyoxylate cycle.

Unit–5: Plant growth – development and stress physiology 12 Hrs.

1. Growth and Development: Definition, phases and kinetics of growth.
2. Physiological effects of Plant Growth Regulators (PGRs)-auxins, gibberellins, cytokinins, ABA, ethylene and brassino steroids.
3. Physiology of flowering: Photo periodism, role of phytochrome in flowering.
4. Seed germination and senescence; physiological changes.

Textbooks:

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

Books for Reference:

- Aravind Kumar & S.S. Purohit (1998) Plant Physiology – Fundamentals and Applications, Agro Botanica, Bikaner
- Datta, S.C. (2007) Plant Physiology,New Age International (P) Ltd., Publishers,NewDelhi
- Hans Mohr & P. Schopfer (2006)Plant Physiology, Springer (India) Pvt. Ltd.,NewDelhi
- Noggle Ray & J. Fritz (2013)Introductory Plant Physiology, Prentice Hall (India),NewDelhi
- Pandey, S.M. &B.K.Sinha (2006)Plant Physiology, Vikas Publishing House, NewDelhi
- Salisbury, Frank B. & Cleon W. Ross (2007)Plant Physiology,Thomsen &Wadsworth, Austalia
- Sinha, R.K. (2014) Modern Plant Physiology, Narosa Publishing House,NewDelhi
- Taiz, L.&E.Zeiger(2003)Plant Physiology, Panima Publishers,NewDelhi
- Verma,V.(2007)TextBook of Plant Physiology,Ane Books India,New D

B.Sc. THREE MAJOR- BOTANY

IV Semester/Botany Core Course –5

Cell Biology, Genetics and Plant Breeding

Course code :BOT401-5

(Total hours of teaching–60@04Hrs./Week)

Course Out comes

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

CO 1: Demonstrates and distinguish prokaryotic and eukaryotic cells, Chromosomes and observe the cell and its components and explain the organization of a eukaryotic chromosome and the structure of genetic material.

CO 2: Discuss the basics of Mendelian genetics, its variations and interpret inheritance of traits in living beings and elucidates the role of extra-chromosomal genetic material for inheritance of characters and the structure, function and regulation of genetic material.

CO 3: Appraise various qualitative and quantitative parameters to study the population and community ecology. Correlate the importance of biodiversity and consequences due to its loss.

Unit– 1 The Cell **12 Hrs.**

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

Unit–2: Chromosomes **12 Hrs.**

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

Unit–3: Mendelian and Non-Mendelian genetics **14Hrs.**

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

be dealt).

3. A brief account of linkage and crossing over; Chromosomal mapping -2 point and 3 point test cross.

4. Concept of maternal inheritance (Corren's experiment on Mirabilisja lapa); Mitochondrial DNA.

Unit–4: Structure and functions of DNA **12 Hrs.**

1.Watson and Crick model of DNA. Brief account on DNA Replication (Semi-conservative method).

2.Brief account on Transcription, types and functions of RNA. Gene concept and genetic code and Translation.

3.Regulation of gene expression in prokaryotes- Lac Operon.

Unit–5: Plant Breeding **12 Hrs.**

1. Plant Breeding and its scope; Genetic basis for plant breeding. Plant Introduction and acclimatization.

2. Definition, procedure; applications and uses; advantages and limitations of: (a)Mass selection, (b)Pure line selection and (c) Clonal selection.

3. Hybridization–schemes, and technique; Heterosis (hybrid vigour).

4. A brief account on Molecular breeding – DNA markers in plant breeding. RAPD, RFLP

Textbooks:

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

Books for Reference:

- S. C. Rastogi (2008)*Cell Biology,*New Age International (P) Ltd. Publishers, New Delhi
- P.K.Gupta (2002)*Cell and Molecular biology,* Rastogi Publications, New Delhi
- B.D.Singh (2008)*Genetics,* Kalyani Publishers, Ludhiana
- A.V.S.S.Sambamurty(2007)*Molecular Genetics,* Narosa Publishing House ,NewDelhi
- Cooper, G.M. & R.E. Hausman (2009) *The Cell – A Molecular Approach,* A.S.M.Press,Washington
- DeRobertis, E.D.P. &E.M.F. DeRobertis Jr.(2002) *Cell and Molecular Biology* Lippincott

Williams &WilkinsPubl.,Philadelphia

- Robert H. Tamarin (2002)*Principles of Genetics,*Tata McGraw –Hill Publishing Company Limited, NewDelhi.
- Gardner, E.J., M. J. Simmons & D.P. Snustad (2004)*Principles of Genetics,* JohnWiley & SonsInc.,NewYork
- Micklos,D.A.,G.A.Freyer&D.A.Cotty(2005)*DNAScience:AFirstCourse,*I.K. International Pvt. Ltd.,NewDelhi
- Chaudhari,H.K.(1983)*Elementary Principles of Plant Breeding*,TMH publishers Co.,NewDelhi
- Sharma, J.R. (1994)*Principles and Practice of Plant Breeding*, Tata McGraw-HillPublishers,New Delhi
- Singh,B.D. (2001)*Plant Breeding : Principles and Methods ,*Kalyani Publishers,Ludhiana
- Pundhan Singh (2015) *Plant Breeding for Undergraduate Students,* KalyaniPublishers, Ludhiana
- Gupta, S.K. (2010) *Plant Breeding : Theory and Techniques,* Agrobios (India), Jodhpur

B.Sc. THREE MAJOR- BOTANY

III B. Sc - SEMESTER- V

Skill Enhancement Course (Elective) Course-7A

Course title :: Plant Propagation

Course code :BOT401-7A

Credits: 05 **Max Marks: 100**

I. Learning Outcomes:

Students at the successful completion of the course will be able to:

CO1: Explain and understands various plant propagation structures and their utilization advantages and disadvantages of vegetative, asexual and sexual plant propagation methods.

CO 2: Assess the benefits of asexual propagation of certain economically valuable plants using apomictics and adventive polyembryony.

CO 3: Demonstrate skills related to vegetative plant propagation techniques such as cuttings, layering, grafting and budding

II. Syllabus: (Hours: Teaching: 50, Lab: 30, Field training: 05, others incl. unit tests: 05)

(*Syllabi of theory, practical and lab (skills) training together shall be completed in 80 hours*)

Unit – 1: Basic concepts of propagation (10h)

1. Propagation: Definition, need and potentialities for plant multiplication; asexual and sexual methods of propagation - advantages and disadvantages.
2. Propagation facilities: Mist chamber, humidifiers, greenhouses, glasshouses, cold frames, hot beds, poly-houses, phytotrons nursery - tools and implements.
3. Propagation by division and separation: Bulbs, pseudobulbs, corms, tubers and rhizomes; runners, stolons, suckers and offsets.

Unit – 2: Apomictics in plant propagation (10h)

1. Apomixis: Definition, facultative and obligate; types – recurrent, non-recurrent, adventitious and vegetative; advantages and disadvantages.
2. Polyembryony: Definition, classification, horticultural significance; chimera and bud sport.
3. Propagation of mango and *Citrus* using apomictic embryos.

Unit – 3: Propagation by cuttings (10h)

1. Cuttings: Definition, different methods of cuttings; root and leaf cuttings.
2. Stem cuttings: Definition and types of stem cuttings; plant propagation by herbaceous, soft wood, semi hard wood cuttings of jasmine and rose hard wood cuttings of mango
3. Physiological and bio chemical basis of rooting; factors influencing rooting of cuttings; Use of plant growth regulators in rooting of cuttings.

Unit – 4: Propagation by layering (10h)

1. Layering: Definition, principle and factors influencing layering.
2. Plant propagation by layering: Ground layering – tip layering, simple layering, trench layering, mound (stool) layering and compound (serpentine layering).
3. Air layering technique – application in woody trees.

Unit – 5: Propagation by grafting and budding (10h)

1. Grafting: Definition, principle, types, graft incompatibility, collection of scion wood stick, scion-stock relationship, and their influences, bud wood certification; micrografting.
2. Propagation by veneer, whip, cleft, side and bark grafting techniques.
3. Bud Grafting: Definition; techniques of 'T', inverted 'T', patch and chip budding.

III. References:

1. Sharma RR and Manish Srivastav.2004. Plant Propagation and Nursery Management International Book Distributing Co. Lucknow.
2. Hartman, HT and Kester, D.E.1976. Plant Propagation: Principles and Practices, Prentice Hall of India Pvt. Ltd. Bombay.
3. Sadhu, M.K. 1996. Plant Propagation. New Age International Publishers, New Delhi.

4. Web resources suggested by the teacher concerned and college librarian including reading material.

B.Sc. THREE MAJOR- BOTANY

Semester V

(Skill Enhancement Course (Elective)

Course title : **Course-7A: Seed technology**

Course code :BOT401-6A

Credits: 05 **3 Hours/week**

Students at the successful completion of the course will be able to:

CO 1: Explain the causes for seed dormancy and methods to break dormancy and Understand critical concepts of seed processing and seed storage procedures.

CO 2: Acquire skills related to various seed testing methods and Identify seed borne pathogens and prescribe methods to control them.

CO 3: Evaluate the legislations on seed production and procedure of seed certification.

Syllabus: (Hours: Teaching: 50, Lab: 30, Field training: 05, others incl. unit tests: 05) (S*yllabi of theory, practical and lab (skills) training together shall be completed in 80 hours*)

Unit - 1: Seed dormancy (10 hrs)

1.Seed and grain: Definitions, importance of seed; structure of Dicot and Monocot seed. Differences between seed and grain

2.Role and goals of seed technology; characteristics of quality seed material.

3.Dormancy: Definition, causes for seed dormancy; methods to break seed dormancy.

Unit – 2: Seed processing and storage (10 hrs)

1. Principles of seed processing: seed extraction , seed pre-cleaning, cleaning, precuring, drying,; grading, pre-storage treatments; bagging and labelling, safety precautions during processing.
2. Seed storage; orthodox and recalcitrant seeds, natural longevity of seeds.
3. Factors affecting longevity in storage; storage conditions, methods and containers.

Unit – 3: Seed testing (10h)

1. Definition of seed vigour, viability and longevity; seed sampling and equipment; physical purity analysis.
2. Seed moisture – importance – methods of moisture determination
3. Seed germination tests using paper, sand or soil – standard germination test; TZ test to determine seed viability; seed health testing.

Unit – 4: Seed borne diseases (10h)

1. A brief account of different seed borne diseases and their transmission.
2. Different seed health testing methods for detecting microorganisms.
3. Management of seed borne diseases; seed treatment methods: spraying and dusting.

Unit – 5: Seed certification (10h)

1. Objectives - Indian seed Act; seed rules and seed order; new seed policy (1988).
2. Seed Inspector: Duties and responsibilities; classes of seeds, phases of certification standards (i.e., Land requirement, isolation distance) etc.
3. Issue of certificates, tags and sealing; pre and post control check: Genetic purity verification, certification, records and reporting.

References

1. Umarani R, Jerlin R, Natarajan N, Masilamani P, Ponnuswamy AS 2006. Experimental Seed Science and Technology, Agrobios, Jodhpur
2. Agrawal, 2005. Seed Technology. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi
3. Desai B D 2004. Seeds Hand Book: Processing and Storage, CRC Press
4. Agarwal V K and J B Sinclair 1996, Principles of Seed Pathology, CRC Press
5. Tunwar NS and Singh SN. 1988. Indian Minimum Seed Certification Standards. CSCB, Ministry of Agriculture, New Delhi.
6. McDonald, M.B. and L.O. Copland. 1999. Seed Science and Technology Laboratory Manual. Scientific Publishers, Jodhpur
7. Web resources suggested by the teacher concerned and the college librarian including reading materia

GOVERNMENT COLLEGE FOR WOMEN (A) GUNTUR

Semester-wise Revised Syllabus under CBCS 2020-21

Four Year – B.Sc. (Hons), Semester – VII
Domain Subject: BOTANY

Higher Order Course 8 (A): Plant Pathology

I. Learning outcomes: Students at the successful completion of the course will be able to:

1. Identify the plant pathogens based on the disease symptoms.
2. Classify the plant diseases based on the causal agents.
3. Explain the life cycle of plant pathogenic organisms.
4. Interpret the factors responsible for disease development and defence mechanisms of host.
5. Predict the role of environment in disease development.
6. Estimate the severity of plant diseases.
7. Choose appropriate methods of disease management.

II. Syllabus of theory:

UNIT-I: Significance and causes of plant diseases (12h)

1. Scope and objectives of plant pathology; socio-economic significance of plant diseases with special reference to India and abroad.
2. Causes and classification of plant diseases ,Quarantines and control measures(addition)
3. Important plant pathogenic organisms (fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, spiroplasmas, viruses, viroids, algae, protozoa), phanerogamic parasites (*Cuscuta, Loranthus, Orobanche, Striga*) and nematodes with examples of diseases caused by them.

UNIT-II: Disease symptomatology (10h)

1. Growth, reproduction, survival and dispersal of important plant pathogens
2. Role of environment and host nutrition on disease development.
3. Host parasite interaction, recognition concept and infection, symptomatology.

UNIT-III: Disease development and defense strategies (12h)

1. Disease development - role of enzymes, toxins, and growth regulators.
2. Defense strategies- oxidative burst; phenolics, phytoalexins, PR proteins, elicitors.
3. Genetics of resistance; Rí genes; mechanism of genetic variation in pathogens.
4. Molecular basis for resistance; genetic engineering for disease resistance.

UNIT-IV: Epidemiology (12h)

1. Compound and simple interest diseases, slow and rapid epiphytotics.
2. Essential conditions for an epidemic, decline of the epidemic.
3. Disease measurement and severity.
4. Disease progress curve and analysis of epidemics.

UNIT-V: Disease management (14h)

1. Principles of plant disease management-cultural, physical, biological, chemical, organic amendments and botanicals
2. Methods of plant disease control, integrated control measures of plant diseases. fungicides, bactericides, and chemotherapy,
3. Nature, properties and mode of action of antifungal, antibacterial and antiviral chemicals.

III. Practical syllabus:

1. Equipment and tools used in plant pathology laboratory.
2. Study of symptoms of plant diseases caused by viruses, bacteria, fungi, and algae.
3. Study of symptoms of plant diseases caused by protozoans and nematodes.
4. Preparation of culture media for fungi and bacteria.
5. Methods to prove Koch's postulates with biotroph and necrotroph pathogens.
6. Isolation techniques and preservation of disease samples.
7. Pure culture techniques of common plant pathogens.
8. Safety measures to prevent the spread of pathogens.

IV. Textbooks:

- Mehrotra, R S and Ashok Aggarwal, (2017) Plant Pathology, Mc Graw Hill India.
- Mundkar.B.B., (1967) Fungi and Plant Disease, Macmillan and Co. Limited
- Rangaswamy. G & Mahadevan A, (1988), Diseases of Crop Plants in India, Prentice HallIndia Learning Private Limited.

V. Reference Books:

- Agrios GN. 2005. Plant Pathology. 5th Ed. Academic Press, New York.
- Fry WE. 1982. Principles of Plant Disease Management. Academic Press, New York.Hewitt HG. 1998.
- Heitefuss R & Williams PH. 1976. Physiological Plant Pathology. Springer Verlag,Berlin, New York.
- Marsh RW. 1972. Systemic Fungicides. Longman, New York. Nene YL & Thapliyal PN.1993. Fungicides in Plant Disease Control. Oxford & IBH, New Delhi.
- Mehrotra RS & Aggarwal A. 2003. Plant Pathology. 2nd Ed. Oxford & IBH, New Delhi.
- Palti J. 1981. Cultural Practices and Infectious Crop Diseases. Springer- Verlag, New York.
- Singh DP & Singh A. 2007. Disease and Insect Resistance in Plants. Oxford & IBH, New Delhi.
- Singh RS. 2002. Introduction to Principles of Plant Pathology. Oxford & IBH, New Delhi.
- Upadhyay RK & Mukherjee KG. 1997. Toxins in Plant Disease Development andEvolving

GOVERNMENT COLLEGE FOR WOMEN (A) GUNTUR

Semester-wise Revised Syllabus under CBCS 2020-21

Four Year – B.Sc. (Hons), Semester – VII

Domain Subject: BOTANY

Higher Order Course 9 (A): Plant Biochemistry

I.Learning outcomes: Students at the successful completion of the course will be able to:

1. List out and classify the metabolites in plants.
2. Explain the general properties and synthesis of biomolecules in plants.
3. Elaborate the functions and applications of plant secondary metabolites.
4. Explain the chemical nature and functions of nucleic acids.
5. Discuss the structure and kinetics of enzymes.
6. Formulate methods to study the lineages of plants using isozymes.

II.Syllabus of theory:

UNIT-I: Metabolites in plants (10 hr)

7. Basic principles of biochemistry, overview of plant biochemistry.
8. Primary and secondary metabolites in plants.
9. Biosynthesis and catabolism of carbohydrates, Classification, D and L designation, open chain and cyclic structures, epimers and monomers, maturation.

UNIT-II: Amino acids, proteins and Lipids (14h)

1. Amino acids - classification, biosynthesis, structure, and stereochemistry,
2. Chemical reactions of amino acids (due to carbonyl and amino groups), pK value, peptide bond-nature and conformation.
3. Proteins - General properties, denaturation and renaturation,
4. Structural organization of proteins primary, secondary, tertiary and quaternary structures.
5. A brief account of lipids in plants.

UNIT-III: Secondary metabolites in plants (12h)

1.Introduction to secondary metabolites in plants: Definition, classification, and their rolesin plant growth, development, and interactions with the environment.

2.Biosynthetic pathways involved in the production of secondary metabolites (alkaloids, flavonoids, terpenoids).

3.Functions and applications of secondary metabolites in plants: Plant defense mechanisms, pigmentation aroma, flavor, medicinal properties, and ecological significance of secondary metabolites.

UNIT-IV: Nucleic acids (12h)

1. Building blocks of nucleic acids, Purines and pyrimidines, nucleosides, nucleotides.
2. Types of DNA (A, B and Z), double stranded linear DNA, Circular DNA and Extra chromosomal DNA.
3. Kinetics of nucleic acids.
4. Different types of RNA and their biological functions
5. Gel Electrophoresis -Agarose and PAGE

UNIT-V: Basic concepts of enzymology (12h)

1. Enzyme structure: specific three-dimensional shape; enzyme kinetics - Michaelis-Menten kinetic model.
2. Enzyme regulation mechanisms - feedback inhibition, allosteric regulation, and covalent modification.
3. Enzyme inhibition: reversible and irreversible.
4. Isozymes and their applications in taxonomy and identification of plant species;Isozyme markers in genetic diversity studies.

Practical syllabus:

1.Qualitative and quantitative (anthrone method) estimation of carbohydrates.
2.Reactions of mono, di, tri and polysaccharides.
3.Estimation of protein by Lowry or biuret method.
4.Reactions of amino sugars, glycosaminoglycons, glycolproteins.
5.Reactions of some common lipids(triacyl glycerides, sterols and carotenoids) inplants.
6.Qualitative and quantitative estimation of alkaloids, flavonoids, terpenoids.
7.Demonstration of electrophoresis.
8.Demonstration of Western blotting
9.Demonstration of ELISA
10.Enzyme kinetic and inhibition assays to measure enzymeactivity(amylase/polyphenol oxidase) in plant extracts using spectrophotometry.

Suggested student activities:

- Estimation of carbohydrate content in different food grains.
- Estimation of protein content in different food grains.
- Identification and estimation of secondary metabolites(gums, resins, catechols) in localplant species.
- Separation and identification of isozymes in different species of a genus or differentgenera of a family.
- Collection of literature of secondary metabolites of plants, their role and applications.
- Preparation of models of enzyme structure and kinetics.
- Study of some enzyme assays.

Textbooks:

- Hans-Walter Heldt and Birgit Piechulla, 2011. Plant Biochemistry, Academic Press, Cambridge
- Chris P. J. Hawes and Marilyn J. Hawes, 2013. Plant Biochemistry: An Introduction, Garland Science, New York
- G. Jones and D. T. Cooke, 2000. Introduction to Plant Biochemistry, Wiley, New Jersey

- Peter M. Dey and John B. Harborne, 1997, Plant Biochemistry and Molecular Biology,John Wiley & Sons, New Jersey

Reference books:

- Bob B. Buchanan, Wilhelm Gruissem, and Russell L. Jones, 2015 Biochemistry andMolecular Biology of Plants, Wiley-Blackwell, New Jersey
- D.D. Davies, 2004 Plant Biochemistry, Springer, New York
- David D. Davies, 1981 The Biochemistry of Plants: A Comprehensive Treatise AcademicPress, Cambridge
- David T. Dennis and David J. Turpin, 1995 Plant Biochemistry and Molecular Biology,Longman, London
- Hans-Walter Heldt and Fiona Heldt, 2005 Plant Biochemistry, Academic Press,Cambridge
- J.B. Harborne, 1988 Introduction to Plant Biochemistry Academic Press, Cambridge
- Principles of Biochemistry – Lehninger, Macmillar U.K. 2021

GOVERNMENT COLLEGE FOR WOMEN (A) GUNTUR

Four Year – B.Sc. (Hons),
Semester – VIIDomain

Higher Order Course 10 (B): Plant Resources and Utilization

I. Learning outcomes: Students at the successful completion of the course will be able to:

1. Explain the significance of plants in human civilization.
2. Acquire a comprehensive knowledge of different plant products used in human nutrition.
3. Discuss the uses of medicinal and aromatic plants.
4. Appraise the importance of timber and non-timber products for value added products.
5. Determine the value of plants as biofuels and bioplastics.

II. Syllabus of theory:

UNIT-1: Food plants (12h)

1. Centers of diversity of plants, origin of crop plants.
2. Domestication and introduction of crop plants; concepts of sustainable development.
3. Cultivation, production, and uses of cereals (rice and wheat), major (jowar and bajra) andminor millets (finger millet, fox tail millet), pulse crops (red gram and black gram) and sugarcane.

UNIT-2: Plant products (12h)

1. A general account of oil seed crops and vegetable oils.
2. A general account of fruit and vegetable yielding plants.
3. Plant sources and economic importance of rubber, latex, gums, resins, dyes, alkaloids andtannins.
4. A general account of major fiber crops in India; textile production from plant fibers.

UNIT-3: Commercial plant products (12h)

1. A general account and economic potential of spices and condiments.
2. Plant sources and economic importance of flavoring products, beverages, fumitories and masticatories and narcotics.
3. Utilization of some important ornamentals, flowering plants,succulents and orchids.

UNIT-4: Medicinal and aromatic plant products (12h)

1. Traditional and modern uses of some medicinal plants of India.
2. Active compounds in medicinal plants and their pharmacological effects.
3. Essential oils and their uses; aromatic plants in perfumery and cosmetics.
4. Phytochemicals and their potential health benefits.

UNIT-5: Timber products and energy crops (12h)

1. Important timber yielding plants of India; wood as a construction and manufacturingmaterial.
2. Other uses of wood products, such as paper and fuel.
3. Energy crops, biofuels and bioplastics.
4. Bamboos, *Eucalyptus, Casuarina* - generation of paper industry raw material.

III. Practical syllabus:

1. Study of morphology and micro-chemical test for stored material of any 3 food crops.
2. Study of morphology and microscopic study anatomy of some plant fibers (cotton, jute, hemp,ramie, sisal).
3. Study of morphology, medicinal and aromatic plants and their useful parts.
4. Study of some oil yielding crops and properties of their oils.
5. Study of some gum, resin, tannin, dye yielding plants.
6. Study of firewood, biofuel and timber yielding plants.

IV. Suggested student activities:

1. Visits to markets selling plant products, collecting data and preparation of a report.
2. Visit to forest places and collecting data on utilization of plants by ethnic people.
3. Collection of literature on wild plants and their utilization.
4. Visits to industries making different plant products.
5. Collection of literature on utilization of plants in folklore and traditional medicines.

V. Textbooks:

- S. K. Jain and R. A. Jain, (2015) Handbook of Plant Resources, Springer, New York.
- H. Panda and A. K. Padhi, (2017) Medicinal Plants and Their Utilization, Springer, Singapore.
- G.E. Wickens (1998) Economic Botany: Principles and Practices, Chapman & Hall, London.
- S.L. Kochhar (1990) The Economic Botany of the Tropics, Macmillan, London.

VI. Reference books:

- K. V. Peter, (2004) Handbook of Herbs and Spices, CRC Press, Boca Raton.
- J. E. Simon, J. A. Duke, and E. A. L. Bobilya, (1990) Handbook of Edible Weeds, CRC Press, Boca Raton.
- J. Smartt and N. Haq, (2016) Handbook of Industrial Crops, Springer, New York.
- P. N. Ravindran, (2017) The Encyclopedia of Herbs and Spices, CABI, Wallingford.
- Beryl B. Simpson (2010) Economic Botany: Plants in Our World, Academic Press, London.
- Michael J. Balick and Paul Alan Cox (1996) Plants, People, and Culture: The Science of Ethnobotany, Scientific American Library, New York.
- Ben-Erik van Wyk (2016) Food Plants of the World: An Illustrated Guide, Timber Press, Portland.
- Jo Homan (2012) Plants That Changed History, Chartwell Books, New York.

GOVERNMENT COLLEGE FOR WOMEN (A) GUNTUR

Four Year – B.Sc. (Hons), Semester – VII

Skill Oriented Course 11(B): Herbal Technology

I. Learning outcomes: Students at the successful completion of the course will be able to:

1. Explain the principles associated with Indian systems of medicine.
2. Identify important medicinal plants of India and elaborate their therapeutic values.
3. Justify the utilization of herbal preparations for common ailments.
4. Formulate appropriate extraction and formulation method for a specific herb.
5. Acquire skills in screening of herbal drugs against diseases.
6. Discuss about the standardization of herbal drugs and WHO guidelines.

II. Syllabus of theory:

UNIT-1: Herbal medicinal systems in India (12h)

1. Herb, herbal medicine: Definition, Importance of herbal therapies; herbal verses conventional drugs. Safety in herbal drugs, toxicity in herbals and their interactions.
2. Historical and cultural use of medicinal plants in India.
3. Basic concepts of Indian systems of medicine - Ayurveda, Unani, Homoepathy, Siddha, and Naturopathy.
4. Classification of herbs and their taxonomy; herbs used as nutraceuticals and healingagents, herbal cosmetics, herbal pesticides.

UNIT-2: Herbal medicines and excipients (12h)

1. Herbal medicines for viral infections - Colds and Flu, Urinary tract infections, Diarrhoea etc.
2. Herbal medicines for skin conditions - burns, cuts and scrapes, rashes, stings and bitesetc.
3. Herbal Excipients – Significance of substances of natural origin as excipients – colorants, sweeteners, binders, diluents, viscosity builders, disintegrants, flavours and perfumes.
4. Analytical profiles of *Acorus calamus, Centella asiatica, Glycyrrhiza glabra, Gymnema sylvestre, Catharanthus roseus* and *Withania somnifera*.

UNIT-3: Herbal extraction and formulation methods (12h)

1. Infusion, decoction, tinctures; digestion, maceration, percolation.
2. Successive solvent extraction, super critical fluid extraction, steam distillation, head spacetechniques, sepbox.
3. Preparation and storage of herbal extracts; Quality control and standardization of extracts.
4. Formulating herbal preparations; calculating dosages based on age, weight, and healthstatus, adjusting dosages based on individual responses.

UNIT-4: Screening methods for herbal drugs (12h)

1. Pharmacological actions of herbal constituents, herb-drug interactions.

2. Anti-fertility agents, anti-diabetic drugs, anti-anginal drugs.
3. Cardiac glycosides, analgesic activity, antipyretic activity.
4. Legal and ethical considerations on dispensing herbal medicines.

UNIT-5: Standardization of herbal drugs (12h)

1. Importance of standardization, problems involved in the standardization of herbs.
2. Standardization of single drugs and compound formulations; WHO guidelines for quality standardized herbal formulations, estimation of parameter limits used for standardization.
3. Conservation strategies of medicinal plants, conservation types.
4. Government policies for protecting the traditional knowledge.

III. Practical syllabus:

1. Taxonomic identification of some medicinal plants.
2. Preliminary phytochemical screening of crude drugs.
3. Determination of moisture content of crude drugs.
4. Determination of extractive values of crude drugs.
5. Preparation of herbal cosmetics.
6. Preparation and standardization of herbal formulation.
7. Evaluation of excipients of natural origin.
8. Determination of the alcohol content of Asava and Arishta.

IV. Suggested student activities:

1. Case studies and practical applications of herbal medicine.
2. Patient education and counselling on the use of herbal medicines.
3. Collection of literature on therapeutic uses and contraindications of common herbalmedicines.
4. Identification of medicinal plants and sustainable harvesting practices.
5. Collection of data on traditional knowledge associated with herbal preparations.
6. Developing treatment plans and integrating herbal medicine into clinical practice.
7. Monograph analysis of herbal drugs from recent Pharmacopoeias.

V. Text books:

- Agarwal, S.S. and Paridhavi, M., (2007) Herbal Drug Technology Universities Press (India) Private Limited.
- Roop K. Khar, S. G. Jadhav, and V. N. Yadav (2011) Herbal Drug Technology, CBS Publishers & Distributors, New Delhi, India.
- Wallis, T.E., (1985) Textbook of Pharmacognosy, CBS Publishers and Distributors.

VI. Reference books:

- Evans, W.C., (2001) Trease and Evans Pharmacognosy Elsevier Health Sciences.
- Lanza, R.P. and Atala, A., (2006) Methods of Tissue Engineering Elsevier Publications.
- "Herbal Drugs: Ethnomedicine to Modern Medicine" by K. K. Janardhanan (2010), Studium Press LLC, Houston, TX, USA.
- Giacinto Bagetta and Marco Cosentino (2018) Herbal Medicines: Development and Validation of Plant-derived Medicines for Human Health, CRC Press, Boca Raton, FL, USA.
- Iris F. F. Benzie and Sissi Wachtel-Galor (2011) Herbal Medicine: Biomolecular and Clinical Aspects, CRC Press, Boca Raton, FL, USA.
- Daan J. A. Crommelin, Robert D. Sindelar, and Bernd Meibohm (2020), Pharmaceutical

Biotechnology: Fundamentals and Applications CRC Press, Boca Raton, FL, USA.

GOVERNMENT COLLEGE FOR WOMEN (A) GUNTUR

Four Year – B.Sc. (Hons), Semester – VII
Domain Subject: BOTANY

Skill Oriented Course 12 (B): Organic Farming

I. Learning outcomes: Students at the successful completion of the course will be able to:

a. Compare and contrast the advantages and disadvantages of conventional and organicfarming.
b. Acquire skills on different composting methods.
c. Acquaint with cultural and crop protection practices related to organic forming.
d. Acquire knowledge on various management practices in organic farming.
e. Discuss about the certification and marketing of organic foods.
f. Explain the initiatives of government in promoting organic farming

Syllabus of theory:

UNIT-1: Basic concepts of organic farming (10h)

g. Organic farming: Definition, ecological social and economic benefits.
h. Organic farming and its components; concepts and principles.
i. Biodynamic and natural farming approaches; permaculture and LEISA farming approaches.
j. Sustainable Agriculture, key indicators of sustainable agriculture.
k. Living soil and healthy plant concepts.

UNIT-2: Organic inputs for soil (12h)

1. Vermicompost production technology.
2. Organic manures: Farmyard Manure (FYM), Enrichment of FYM.

3. Compost, methods of composting (Bangalore, Indore, Coimbatore, NADEP methods).
4. Green manuring, classification of green manures.
5. Classification of organic residues, recycling of organic residues,

UNIT-3: Organic crop management (12h)

1. Introduction to Organic Crop Management – land preparation, planting technic, nutrientmanagement.
2. Factors considered for nutrient management; recommended nutrient quantity –blanket, majorproblems; balance sheet method.
3. Nutrient composition of some organic resources, right timing of nutrient application.
4. Right method of nutrient application, nutrient use efficiency.

UNIT-4: Cultural and crop protection practices (14h)

1. Pre-sowing irrigation; crop rotation, intercropping and mixed cropping.
2. Use of tolerant and resistant varieties; manipulation in sowing dates, irrigation/flooding, destruction of volunteer plants.
3. Pest and disease management – preventive, physical and mechanical methods.
4. Organic crop management – rice, red gram, groundnut, and tomato.
5. Government interventions to promote organic farming: NPOF, NPMSHF, NHM, RKVY,KVK and APEDA.

UNIT-5: Certification and Marketing of Organics (12h)

1. Organic certification process – definition, need, aim and scope, requirements to maintaincertification.
2. Organic certification process – labeling of products, NPOP, organic quality control, standards, accreditation, inspection, and certification.
3. Operational structure of organic certification.
4. Marketing of organic products.

II. Practical syllabus:

a. Preparation of Jeevamrutham (liquid and solid) and Beejamrutham.
b. Preparation of Neemastram and Brahmastram.
c. Preparation of Agniastram and Dashaparni Kashayam.
d. Study of intercropping method.
e. Study of water management in Organic Farming.
f. Study of livestock component in Organic Farming.
g. Hands on training on vermicompost preparation.
h. Study of different organic and green manures.

III. Suggested student activities:

1. Making a study report on soil chemistry in a conventional and organic crop field.
2. A case study on organic farming of an agricultural crop from beginning to ending.
3. A case study on organic farming of a horticulture crop from beginning to ending.
4. A study on economics of a crop in conventional and organic farming methods.
5. A case study on getting certification for an organic farm product.

IV. Textbooks:

- Vandana Shiva, Poonam Pande and Jitendra Singh, (2004). Principles of Organic Farming -

Renewing the Earth's Harvest, Navdanya, New Delhi.

- Sujit Chakrabarty, Sumati Narayan, Farooq Ahmad Khan, (2019). Arts and Science of Organic Farming, Purna Organics
- Thapa, U., and P. Tripathi, (2016). Organic Farming in India, Agrotech Publictions, Udaipur
- Peter, V. Fossel, (2007). Organic Farming (Everything You Need to Know), Voyageur Press, USA

V. Reference books:

- Richard Wiswall (2009), The Organic Farmer's Business Handbook Chelsea Green Publishing, White River Junction, VT, USA.
- William Lockeretz (2007), Organic Farming: An International History CABI Publishing, Wallingford,
- Ann Larkin Hansen (2010), The Organic Farmer's Manual: A Comprehensive Guide to Starting and Running a Certified Organic Farm Storey Publishing, North Adams, MA, USA.
- Masanobu Fukuoka (1978), The One-Straw Revolution: An Introduction to Natural Farming Rodale Press, Emmaus, PA, USA.
- Gary Zimmer (2000), The Biological Farmer: A Complete Guide to the Sustainable & Profitable Biological System of Farming Acres U.S.A., Austin, TX, USA
- Albert Howard (1947), The Soil and Health: A Study of Organic Agriculture University Press of Kentucky, Lexington, KY, USA.
- Terri Paajanen (2014), The Complete Guide to Organic Livestock Farming Atlantic Publishing Group, Inc., Ocala, FL, USA.
- ary J. Martin (2004) Ethnobotany: A Methods Manual, Earthscan Publications, London

GOVERNMENT COLLEGE FOR WOMEN (A) GUNTUR

Four Year – B.Sc. (Hons), Semester – VIII

Domain Subject: BOTANY

Higher Order Course 13(A): Plant Biotechnology

I. Learning outcomes: Students after the successful completion of the course will be able to:

1. Explain the scientific techniques and tools used in plant tissue culture laboratories.Detailed knowledge about applications of plant tissue culture in agriculture and horticulture
2. Acquire skills related to various aspects of plant tissue culture.
3. Evaluate & Justify the role of transgenic plants in solving certain plant related beneficiary issues.

the role of plant biotechnology in bioenergy and phytoremediation.

6. Judge the biosafety and bioethics issues related to plant biotechnology.

II. Syllabus of theory:

UNIT-1: Basic techniques in plant tissue culture (14h)

1. Sterilization techniques; formulation of media for plant tissue culture; role of plant growth regulators in plant differentiation and morphogenesis.
2. Concept of totipotency, initiation and maintenance of callus cultures; induction ofmorphogenesis in vitro.
3. Somatic embryogenesis and organogenesis; factors affecting somatic embryogenesis and organogenesis.
4. Molecular overview of somatic embryogenesis; synthetic seeds and their applications.
5. Applications of plant biotechnology in agriculture and horticulture.

UNIT-2: Organ and haploid culture techniques (10h)

1. Importance and applications of meristem culture, zygotic embryo culture, endospermculture.
2. Micropropagation and its uses, commercial exploitation of micropropagation.
3. Production of haploids using anther, pollen and unfertilized ovule cultures, theircharacterization and applications.

UNIT-3: Cell and protoplast cultures (14h)

1. Cell suspensions – continuous and batch cultures; mass cultivation of plant cells usingbioreactors.
2. Production of secondary metabolites from cell cultures, strategies used for enhancedproduction of secondary metabolites. Biotransformation using plant cell cultures.
3. Isolation, purification, and culture of protoplasts; methods used for protoplast fusion.
4. Somatic hybridization/cybridization –selection systems for somatic hybrids/cybrids, their characterization and applications.

UNIT-4: Transgenic plants (12h)

1. Transgenic plants – definition, biosafety and ethical issues associated with transgenicplants.
2. Herbicide resistance (glyphosate), insect resistance (alpha amylase inhibitor).
3. Virus resistance (coat protein mediated, nucleocapsid gene), disease resistance (antifungal proteins, PR proteins).
4. Quality improvement (Golden rice), Shelf-life enhancement (Flavr savr tomato).

UNIT-5: Advances in plant biotechnology (10h)

1. Plant synthetic biology and its applications; plant-based vaccines and therapeutics.
2. Biofortification and genetically modified foods.
3. Biodegradable plastics, polyhydroxybutyrate.

GOVERNMENT COLLEGE FOR WOMEN (A) GUNTUR

Four Year – B.Sc. (Hons), Semester – VIIIRevised

Syllabus under CBCS 2020-21

Four Year – B.Sc. (Hons), Semester – VIII

Domain Subject: BOTANY

Higher Order Course 14(A): Plant Genetic Engineering

I. Learning outcomes: Students at the successful completion of the course will be able to:

1. Explain the tools and techniques used in plant genetic engineering.
2. Acquire skills on isolation DNA and making chimeric DNA.
3. Elaborate about cloning vectors and gene cloning methods.
4. Explain about construction of DNA libraries.

5.Justify the role of genetic engineering to make products for human welfare.6.Judge the biosafety and bioethics related to plant genetic engineering.

II. Syllabus of theory:

UNIT I: Tools in genetic engineering (12h)

1. Genetic engineering - Introduction and outlines of genetic engineering.
2. DNA splicing and joining - enzymatic cleavage of DNA; restriction and modificationenzymes-classification, nomenclature, and importance of restriction endonucleases.
3. Restriction mapping, DNA ligases, polynucleotide kinase, alkaline phosphatases, S1nuclease, terminal transferase, Bal 31 nuclease.

UNIT II: Gene cloning (10h)

1. Cloning vectors-characteristics of a vector.
2. Natural plasmids used as vectors- advantages and disadvantages.
3. Artificial plasmids and their importance as cloning vectors.
4. Vectors used for cloning in *E.coli*. (Plasmids, bacteriophage derivatives, Cosmides, BACs),yeast (YACs, shuttle vectors), higher plants (Ti plasmid derivatives, caulimovirus)

UNIT III: DNA libraries (12h)

1. Genomic DNA library and cDNA library synthesis.
2. Joining of DNA fragments to vector molecules, cohesive termini ligation and blunt endligation – linkers, adaptors and homopolymer tails.
3. Screening of recombinants for a positive clone- genetic, biochemical and hybridizationmethods. Microarrays.

UNIT IV: Techniques in rDNA technology (14h)

1. Introduction of Recombinant DNA molecules into appropriate hosts; competent cellspreparation, electroporation, microinjection, and particle bombardment method, and selection of transformants.
2. *Agrobacterium* mediated transformation of plant cells.
3. Identification of transformed cells and micropropagation of transformed cell into callus,and regeneration of transgenic plants.
4. Expression of cloned genes-construction of expression vectors.

UNIT V: Applications of genetic engineering (12h)

1. DNA Finger Printing - RAPD, RFLP and AFLP analysis.
2. Application of RFLP in pedigree analysis, biodiversity, genetic counseling, and germ plasmmaintenance.
3. Plantibodies and plant vaccines; applications of plant genetic engineering in agriculture,medicine, and industry.
4. Environmental and safety concerns of plant genetic engineering; ethical considerations inplant genetic engineering

III. Practical syllabus:

1. Isolation of DNA from plant cells.
2. Thermal melting of DNA and preparation of single stranded DNA template3.Isolation of plasmid DNA.
4. In vitro DNA ligation, transformation of *E.coli*.
5. Agarose gel electrophoresis and restriction mapping of DNA.
6. Demonstration of DNA sequencing.
7. Demonstration of PCR.
8. Demonstration of reporter gene assay (Gus/CAT/b-GAL).
9. Demonstration of RFLP and RAPD techniques.

IV. Suggested student activities:

1. Studying tools and techniques in plant genetic engineering using virtual labs on websites.
2. Collection of literature on current applications of plant genetic engineering.
3. Case studies on genetic modification of plant traits using genetic engineeringmethods
4. Collecting literature on molecular markers for plant genetic engineering.
5. Report on ethical considerations and regulations governing plant genetic engineering.
6. Case studies of controversies surrounding plant genetic engineering - public perceptionsand attitudes.

V. Textbooks:

- B.K. Sarma and P.S. Rao (2005) Plant Genetic Engineering: Principles and Applications. IKInternational Publishing House. New Delhi, India.
- Adrian Slater, Nigel W. Scott, and Mark R. Fowler (2013) Plant Biotechnology: The GeneticManipulation of Plants, Oxford University Press Oxford, UK.
- Altman (2005) Methods in Molecular Biology: Plant Genetic Engineering Humana Press,Totowa, NJ. L.
- Peña and F. A. Rodríguez (2013) Transgenic Plants: Methods and Protocols, Humana Press,New York
- S.B. Primrose (1994). Molecular Biotechnology, Blackwell Scientific Pub. Oxford.

VI. Reference Books:

- John Hammond and Brian G. Atkinson (2019) Plant Genetic Engineering, Springer,Cham,Switzerland
- Trevor A. Thorpe (2005) Plant Genetic Engineering, Blackwell Publishing, Oxford, UK
- C. Neal Stewart Jr. (2016) Plant Biotechnology and Genetics: Principles, Techniques, andApplications Wiley-Blackwell, Hoboken, NJ.
- T. Gerats and J. H. A. Schell (2000) Genetic Engineering of Plants: An AgriculturalPerspective Springer, Dordrecht.
- S.K. Sopory and R.B. Fenton (2015) Plant Genetic Engineering Springer, Dordrecht.
- J. Sambrook, E. Frisch and T. Maniatis (2000) Molecular Cloning: Laboratory manual, ColdSpring Harbor Laboratory Press New York.
- M.K.Sateesh,Bioethics and Biosafety 2008 I K International Publishing House.

Goel and Parashar, IPR, Biosafety and Bioethics 1e Paperback-2013,Pearso

Revised Syllabus under CBCS 2020-21

Four Year – B.Sc. (Hons), Semester – VIII

Higher Order Course 15 (B): Phyto-medicines and Ethnobotany

I. Learning outcomes: Students at the successful completion of the course will be able to:

1. Understand the importance of phytomedicines in human health.
2. Explain about certain healing herbs and their applications.
3. Appraise the value of some plant products as phytomedicines for common ailments ofhumans.
4. Analyze the ethnic communities in India and their ethnobotanical knowledge.
5. List out plants used as phytomedicines and ethnomedicines.
6. Interpret the cultural practices of ethnic communities and their role in conservation ofplants.

II. Syllabus of theory:

UNIT-1: Basic concepts of phytomedicines (10h)

1. Phytomedicines: Definition, history, and cultural significance of phytomedicines.
2. Classification of phytomedicines; advantages and limitations of using phytomedicines.
3. Traditional and modern uses of phytomedicines; pharmacological principles and mechanismsof action of phytomedicines.
4. Sources of phytomedicine, their safety and toxicity; extraction methods for phytomedicines.

UNIT-2: Phytomedicines - therapeutic applications (14h)

Botanical description, chemical constituents, pharmacological properties, therapeutic applications, dose, administration, and safety considerations of following phytomedicines:

(1) Turmeric (*Curcuma longa*) (2) Garlic (*Allium sativum*) (3) Ginger (*Zingiber officinale*)

(4) Ginkgo (*Ginkgo biloba*) (5) Ginseng (*Panax ginseng*) (6) Aloe vera (*Aloe barbadensis*)

(7) Peppermint (*Mentha piperita*) (8) Licorice (*Glycyrrhiza glabra*)

UNIT-3: Plant products for health (12h)

1. Medicinal plants and products as per Indian Herbal Pharmacopoeia (IHP).
2. A general account of plants used in Ayurveda, Unani, Siddha, and Homoeopathic systems ofmedicine for various disorders.
3. Chemical nature, uses in pharmacy, medicinal and health benefits of following plantproducts:
   a. Carotenoids: α and β – Carotene, Lycopene and Lutein
   b. Limonoids: d- Limonene and α – Terpineol (c) Saponins: Glycyrrhizin and Shatavarins
   (d) Flavonoids: Rutin, Hesperidin, Naringin and Quercetin (e) Phenolic acids:- Ellagic acid
4. Psychoactive plants classification; stimulants, plants for mental health, hallucinogens,depressants and anti-depressants.

UNIT-4: Ethnobotany in India (12h)

1. Ethnobotany: Definition, history, significance, scope and objectives; ethnobotany as an interdisciplinary science; branches of ethnobotany.
2. Centers of ethno-botanical studies in India; major and minor ethnic communities of India,ethnic communities of Andhra Pradesh - anthropology, customs and beliefs.
3. Plants used by ethnic groups as food, intoxicants and beverages, fodder, fiber, resins, oils,fragrances and other uses.
4. Ethno- and folklore medicines in India and Andhra Pradesh; Role of ethnomedicines andtheir scope in modern times.

UNIT-5: Ethnomedicinal plants (12h)

1. Medico-ethnobotanical sources in India; Significance of the following plants in ethno-botanical practices:

(a) *Azadirachta indica* (b) *Ocimum sanctum* (c) *Vitex negundo* (d) *Gloriosa superba* (e) *Tribulus terrestris* (f) *Pongamia pinnata* (g) *Cassia auriculata* (h) *Indigofera tinctoria*

2. Role of ethnobotany in modern medicine with reference to *Rauvolfia serpentina,Trichopus zeylanicus, Artemisia vulgaris* and *Withania somnifera*.
3. Role of ethnic groups in conservation of plant genetic resources; ethnobotany as a tool toprotect the interests of ethnic groups.
4. Biopiracy, Intellectual Property Rights (IPR) and Traditional Knowledge (TK).

III. Practical syllabus:

1. Studying ethnic food crops of their locality.
2. Studying ethnomedicines for humans and animals.
3. Studying ethnobotanical databases and Traditional knowledge Digital Library (TKDL).
4. Studying various plant products used as medicines.
5. Macroscopic and microscopic evaluation of phytomedicines and ethnomedicines.
6. Collection of herbaria of some medicinal plants used by ethnic people of their locality.
7. Report on traditional knowledge of ethnic groups in their locality.

IV. Suggested student activities:

1. Collection of literature on medicinal plants used by humans and associated traditionalknowledge.
2. Interacting with ethnic people in their area and learning about their traditional knowledge.
3. Making a report on various plants used by ethnic communities of their area.
4. Report on role of sacred groves and ethnic people in conservation of plants.
5. Listing out important ethnic communities in India and studying their cultural practices andbeliefs.
6. Collection of literature on biopiracy of TK and role of IPR in protecting TK.

V. Text Books:

- Jain,S.K. (1995) Manual of Ethnobotany, Scientific Publishers, Jodhpur.
- Jain,S.K. (1981) Glimpses of Indian. Ethnobotany, Oxford and IBH, New Delhi
- Jain,S.K.(1989) Methods and approaches in ethnobotany. Society of ethnobotanists,
- Lucknow, India.
- James A. Duke (2002) Handbook of Medicinal Herbs, CRC Press, Boca Raton, FL. Charles W. Fetrow and Juan R. Avila (2000) The Complete Guide to Herbal Medicines,Pocket Books, New York, NY.

VI. Reference Books:

- Iris F. F. Benzie and Sissi Wachtel-Galor (2011) Herbal Medicine: Biomolecular and ClinicalAspects, CRC Press, Boca Raton, FL.
- Ashish Kumar Singh (2014) Phytochemicals: Biosynthesis, Function and Application,Springer Science & Business Media, New York, NY.
- Simon Mills and Kerry Bone (2005) The Essential Guide to Herbal Safety, Elsevier ChurchillLivingstone, St. Louis, MO.
- Schultes, R.E. and R.F. Raffauf (1990). The Healing Forest: Medicinal and Toxic Plants ofthe Northwest Amazonia. Dioscorides Press, Portland, Oregon.
- Balick, M.J., E. Elisabetsky, and S.A. Laird (eds.) (1996). Medicinal Resources of the Tropical Forest: Biodiversity and Its Importance to Human Health. Columbia UniversityPress, New York.
- Duke, J.A. (1992). Handbook of Edible Weeds. CRC Press, Boca Raton, Florida.
- Martin, G.J. (1995). Ethnobotany: A Methods Manual. Chapman and Hall, London

. Semester – VIII

Skill Oriented Course 16(A): Biofertilizers and Biopesticides

I. Learning outcomes: Students on successful completion of the course will be able to:

1. Understand the advantages and disadvantages of biofertilizers and biopesticides.
2. Identify different microbes used as biofertilizers and biopesticides.
3. Acquire skills on isolation and culture of microbial agents used as biofertilizers andbiopesticides.
4. Understand the process of production and application of biofertilizers and biopesticides.
5. Evaluate the economic and environmental impacts of using biofertilizers andbiopesticides.
6. Gain knowledge about the regulations on the production and use of biofertilizers andbiopesticides.

II.Syllabus of theory:

Unit 1: Introduction to biofertilizers (12h)

1. Biofertilizers: Definition, scope, status, and importance; Advantages and limitations ofbiofertilizers compared to chemical fertilizers.
2. Types of biofertilizers (e.g. nitrogen-fixing, phosphate-solubilizing, plant growth-promoting).
3. Structure and characteristic features of bacterial (*Azospirillum, Azotobacter, Rhizobium*),actinomycetes (*Frankia*), cyanobacterial (*Anabaena, Nostoc, Hapalosiphon*) and fungal (AM and ectomycorrhiza) biofertilizers.

UNIT-2: Production and application of biofertilizers (14h)

1. Production of biofertilizers: Strain selection, sterilization, growth, equipment, fermentation(solid state and liquid), mass production of carrier based and liquid bio fertilizers.
2. Factors affecting the production of biofertilizers (i.e., temperature, pH, aeration, carbonsource); quality control of biofertilizers
3. Application methods and dosage of biofertilizers.
4. Effect of biofertilizers on soil fertility, plant growth, and yield.

UNIT-3: Commercialization and future prospects of biofertilizers (10h)

1. Biofertilizers -storage, shelf life, quality control and marketing; regulatory framework andcertification for biofertilizers.
2. Application technology for seeds, seedlings, tubers, sets etc.; factors influencing theefficacy of bio fertilizers.
3. Economic feasibility and cost-benefit analysis of using biofertilizers.
4. Future prospects and potential of biofertilizers in sustainable agriculture and environmentalprotection.

UNIT-4: Biopesticides and applications (14h)

1. Biopesticides: Definition and classification; advantages and limitations of biopesticidescompared to chemical pesticides. Modes of action and mechanisms of biopesticides.
2. Characteristics and applications of microbial pesticides – bacteria, fungi and viruses.
3. Characteristics and applications of botanical pesticides (plant extracts and essential oils) andbiochemical (pheromones and repellents).
4. Biocontrol agents (*Trichoderma* spp., *Pseudomonas* spp. and *Bacillus* spp) and their efficacyon seed borne and soil borne plant pathogens.

UNIT-5: Production and marketing of biopesticides (10h)

1. Production and formulation of biopesticides and biocontrol agents.
2. Commercialization and market trends of biopesticides; regulatory framework forbiopesticides.
3. Integrated pest management (IPM) and biopesticides; future prospects and challenges forbiopesticides.

II. Practical syllabus:

1. Nutritional media and their preparations.
2. Enumeration of microbial population in soil- bacteria, BGA, fungi, actinomycetes.
3. Methods of isolation and purification of microbial cultures.
4. Isolation of Rhizobium from legume root nodule.
5. Isolation of BGA from rhizosphere.
6. Isolation of Mycorrhiza.
7. Culture of *Trichoderma* spp., *Pseudomonas* spp. and *Bacillus* spp.
8. Quality control tests for biofertilizers, Biopesticides and bioagents.

III. Suggested student activities:

1. Collection of data on utilization of biofertilizers and biopesticides by farmers andconducting awareness campaign at farmers' fields.
2. Collection of literature on various biofertilizers, biopesticides and biocontrol agents.
3. Visits to production units of biofertilizers, biopesticides and biocontrol agents.
4. Case studies on efficacy of biofertilizers, biopesticides and biocontrol agents.
5. Report on mass production technologies of biofertilizers, biopesticides and biocontrolAgents.
6. Case study on ill effects of chemical fertilizers and pesticides.

IV. Textbooks:

- Subba Rao, N.S. (1993) Biofertilizers in Agriculture and Forestry, Oxford and IBH. Publ.Co., New Delhi.
- Das, A. C., & Mukherjee, A. K. (2019). Biofertilizers for sustainable agriculture: a review ofprinciples, processes, and practices. Springer.
- Sadasivam, S., & Manickam, A. (2018). Biofertilizers technology. Springer.
- S. S. Gnanamanickam, (2011) Biopesticides: Pest Management and Regulation, CABInternational, Wallingford, UK.
- B.S. Bisht, J.S. Panwar, and V.P. Bhatt, (2016) Handbook of Microbial Biofertilizers, CRCPress, Boca Raton, FL.

V. Reference Books:

- Gupta, S., & Prasad, R. (2018). Microbial inoculants in sustainable agricultural productivity.Springer.
- Akhtar, M. S., & Siddiqui, Z. A. (2018). Role of rhizobacteria in soil: interactions andmechanisms. Springer.
- N. Amaresan, N. Kumar, and A.K. Gupta, (2011) Handbook of Biofertilizers and MicrobialPesticides, Springer Science & Business Media, New York, NY.
- Opender Koul and G.S. Dhaliwal, (2009) Biopesticides: State of the Art and FutureOpportunities, Springer Science & Business Media, New York, NY.

Franklin R. Hall and Julius J. Menn, (1999) Biopesticides: Use and Delivery, Humana Press,Totowa, NJ.

Contact us @

botanygcwgunturt@gmail.com, botany@gcwguntur.ac.in

Call us @

8247092267

9985166449

9676609109

8500797338

B.Sc.

THREE MAJOR

HORTICULTURE

COURSE BOOKLET

GOVERNMENT COLLEGE FOR WOMEN (A) GUNTUR

I Semester /HorticultureCoreCourse - 1
Fundamentals of Horticulture and Soil Science
(Total hours of teaching ñ 60 @ 04 Hrs./Week)

Theory :

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

- CO1-Understand the scope and potential of horticulture in India and Andhra Pradesh. understand the basics of soil science
- CO2-Classify the horticulture plants based on soil and climate and explain about integrated nutrient management .and apply the knowledge of different systems of planting in orchard planning Analyse and predict the planting densities
- CO3-Explain and justify the role of soil as a medium for plant growth and and develop the skills training, pruning .and soil testing

Unit I : Introduction to Horticulture **12 Hrs.**

1. Horticulture: Definition, importance of horticulture in terms of economy, production.employment generation, environmental protection and human resource development.
2. Divisions of horticulture with suitable examples and their importance.
3. Area, production of Horticultural crops in A.P. and India.
4. Fruit and vegetable zones of India and Andhra Pradesh.
5. Export scenario and scope for Horticulture in India.

Unit II : Classification Horticulture Crops **12 Hrs.**

1. Classification of horticultural crops based on soil and climatic requirements.
2. Vegetable crop gardens ,Nutrition and kitchen garden, tracer garden , vegetable forcing market garden and roof garden.

3. Gardens in floriculture ñ flower gardens ñ soil and mixed gardens; land scapeHorticulture.

Unit III :Characteristics of Orchards **12 Hrs.**

1. Orchard: Definition, different systems of planting orchards , square, rectangularQuincunx, hexagonal and contour.
2. Calculation of planting densities in different systems of planting.
3. Different types and methods of pruning.
4. Training: Definition, principles and objectives; merits and demerits of open and close centered, and modified leader systems.

Unit IV : Physico-chemical characteristics of Soil **12 Hrs.**

1. Soil: Definition, minerals and weathering to form soils; factors of soil formation.
2. Soil taxonomy; soil color, texture and structure; other physical properties and stability.
3. Soil colloids and charges; ion adsorption and exchange; soil temperature and soil air.
4. Soil pH and acidity; soil alkalinity and salinity.

Unit V :Soil as a living matter **12 Hrs.**

1. Soil organic matter , composition and decomposability.
2. Humus , fractionation of organic matter.
3. Soil biology: Soil microorganisms and fauna beneficial and harmful roles.
4. Integrated nutrient management and soil tests.

GOVERNMENT COLLEGE FOR WOMEN (A) GUNTUR

I Semester /HorticultureCoreCourse - 1
Fundamentals of Horticulture and Soil Science
(Total hours of teaching ñ 60 @ 04 Hrs./Week)

Theory :

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

- CO1-Understand the scope and potential of horticulture in India and Andhra Pradesh. understand the basics of soil science
- CO2-Classify the horticulture plants based on soil and climate and explain about integrated nutrient management .and apply the knowledge of different systems of planting in orchard planning Analyse and predict the planting densities
- CO3-Explain and justify the role of soil as a medium for plant growth and and develop the skills training, pruning .and soil testing

Unit I : Introduction to Horticulture **12 Hrs.**

6. Horticulture: Definition, importance of horticulture in terms of economy, production.employment generation, environmental protection and human resource development.
7. Divisions of horticulture with suitable examples and their importance.
8. Area, production of Horticultural crops in A.P. and India.
9. Fruit and vegetable zones of India and Andhra Pradesh.
10. Export scenario and scope for Horticulture in India.

Unit II : Classification Horticulture Crops **12 Hrs.**

4. Classification of horticultural crops based on soil and climatic requirements.
5. Vegetable crop gardens ,Nutrition and kitchen garden, tracer garden , vegetable forcing market garden and roof garden.
6. Gardens in floriculture ñ flower gardens ñ soil and mixed gardens; land scapeHorticulture.

Unit III :Characteristics of Orchards **12 Hrs.**

5. Orchard: Definition, different systems of planting orchards , square, rectangularQuincunx, hexagonal and contour.
6. Calculation of planting densities in different systems of planting.
7. Different types and methods of pruning.
8. Training: Definition, principles and objectives; merits and demerits of open and close centered, and modified leader systems.

Unit IV : Physico-chemical characteristics of Soil **12 Hrs.**

5. Soil: Definition, minerals and weathering to form soils; factors of soil formation.
6. Soil taxonomy; soil color, texture and structure; other physical properties and stability.
7. Soil colloids and charges; ion adsorption and exchange; soil temperature and soil air.
8. Soil pH and acidity; soil alkalinity and salinity.

Unit V :Soil as a living matter **12 Hrs.**

5. Soil organic matter , composition and decomposability.
6. Humus , fractionation of organic matter.
7. Soil biology: Soil microorganisms and fauna beneficial and harmful roles.
8. Integrated nutrient management and soil tests.

B.Sc. THREE MAJOR HORTICULTURE

III Semester /Horticulture Core Course - 3

Course title : Basics of Vegetable Science (Olericulture)

Course code HORT4-3

(Total hours of teaching – 60 @ 04 Hrs./Week)

Theory:

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

CO1 Study and understand the different varieties of vegetable crops & their cultivation aspects.

CO2 Identify and analyze intercultural operations, different pests and disease in vegetable crops.

CO3 Explain and adapt different post harvesting techniques and disease and pest management techniques in vegetable crops.

Unit – 1: Introduction to Vegetable crops **12 Hrs.**

1. Importance of vegetable cultivation in India and Andhra Pradesh.
2. Classification and Nutritive value of vegetables.
3. Area and production of vegetables in India and Andhra Pradesh.
4. Export and import potential of vegetables in India. Constraints in vegetable production and remedies to overcome them.

Unit – 2: Solanaceous and Leafy vegetables **12 Hrs.**

Importance, morphology and taxonomy, varieties, climate and soil, seeds and sowing, Manuring, irrigation, intercultural operations, diseases and their control, harvesting and yield of following crops:

Cultivation of (a) Brinjal(b) Tomato(c) *Capsicum* (d) Spinach (c) Coriander and (d) *Mentha*

Unit – 3: Root and Tuber crops **16 Hrs.**

Importance, morphology and taxonomy, varieties, climate and soil, seeds and sowing, manuring, irrigation, intercultural operations, diseases and their control, harvesting and yield of following crops:

Cultivation of (a) Carrot(b) Beet root(c) Tapioca and (d)*Colocasia*

Unit – 4: Cole crops **08 Hrs.**

Importance, morphology and taxonomy, varieties, climate and soil, seeds and sowing, manuring, irrigation, intercultural operations, diseases and their control, harvesting and yield of following crop:

Cultivation of (a) Cabbage and (b) Cauliflower

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

Importance, morphology and taxonomy, varieties, climate and soil, seeds and sowing, manuring, irrigation, intercultural operations, diseases and their control, harvesting and yield of following crops: Cultivation of (a)Cluster bean (b) Cow pea and (d) *Dolichos*

Text books :

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

B.Sc. THREE MAJOR HORTICULTURE

IV Semester /Horticulture Core Course - 4

Course title : Basics of Fruit Science (Pomology)

Course code HORT4-4

(Total hours of teaching – 60 @ 04 Hrs./Week)

Theory :

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

CO1: Define and classify the value of fruits in terms of human nutrition and economy of nation. potential fruit zones in various states of our country. fruiting plants based on temperature requirements.

CO2: Apply and analyze knowledge various cultivation practices for different fruit crops the special intercultural operations done in fruit crops varieties of different fruit crops.

CO3: Explain and Elaborate about pests and diseases of fruit crops and develop skills to manage the same Integrated Orchard Management various entrepreneurial skills related to fruit science.

Unit – 1: Introduction to Fruit crops **12 Hrs.**

1. Importance of fruit growing in India and Andhra Pradesh.
2. Nutritive value of fruits.
3. Area and production of India and Andhra Pradesh.
4. Export and import potential of fruits in India. Constraints in fruit production and remedies to overcome them.

Unit – 2: Tropical Fruit Crops **12 Hrs.**

Origin, history, distribution, area and production, uses and composition, varieties, soil and climatic requirements, propagation, planting, training and pruning, manuring and fertilizer application, irrigation, intercropping, harvesting and yield, diseases and pests of the following tropical fruit crops:

(a) Mango (b) Guava and (c) Papaya

Unit – 3: Sub-tropical and temperate fruit crops **12 Hrs.**

Origin, history, distribution, area and production, uses and composition, varieties, soil and climatic requirements, propagation, planting, training and pruning, manuring and fertilizer application, irrigation, intercropping, harvesting and yield, diseases and pests of the following sub-tropical and temperate fruit crops:

(a) Grapes (b) Pomegranate (c) Citrus

Unit – 4: Arid and minor fruit crops **12 Hrs.**

Origin, history, distribution, area and production, uses and composition, varieties, soil and climatic requirements, propagation, planting, training and pruning, manuring and fertilizer application, irrigation, inter cropping, harvesting and yield, diseases and pests of the following arid fruit crops:

(a) Amla (b) Dates

Unit – 5: Management practices for fruit crops 12 Hrs.

1. Sustainable Production Practices for Local Fruit Production.
2. Integrated Orchard Management/Principles of IPM.
3. Harvesting and Labor Concerns
4. Grading, packing, storage and marketing of fruits.

Text books :

- **Chattopadhyay, T.K.1997.** Text book on Pomology (Fundamentals of fruit growing), Kalyani Publishers, Hyderabad.
- **Chundawat, B.S. 1990.** Arid Fruit Culture, Oxford and IBH, New Delhi.

Gourley J H 2009. Text book of Pomology, Read Books Publ

Course title : Pests and Diseases of Horticulture Plants and their Management
Course code HORT4-5
(Total hours of teaching – 60 @ 04 Hrs./Week) credits :4

Theory:

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

CO 1-Define and classify various pests, diseases and fungicides.

CO2- Identify, analyze and apply the knowledge of different pests and disease symptoms and their management.

CO3-Judge and design integrated pest management and formulation of Fungicidal solutions

Unit – 1: Basics of Entomology and Plant Pathology

1. Integrated Orchard Management (Distribution, host range, biology, nature of damage and management) in horticultural crops.
2. Disease triangle and disease pyramid; Plant Pathology: Definition
3. A general account on symptoms of plant diseases caused by Viruses and Bacteria.
4. A general account on symptoms of plant diseases caused by Fungi.

Unit – 2: Pests and diseases of Vegetables crops

1. Bhendi: Spotted boll worms, Red cotton bug, Yellow vein mosaic.
2. Cucurbits: Fruit flies, Pumpkin beetles; Downy and powdery mildews.
3. Potato: Potato tuber moth, Golden cyst nematode; Late blight.
4. Sweet Potato: Sweet potato weevil, Vine borer; Mottled necrosis.

Unit – 3: Pests and diseases of Fruit crops

1. Coconut: Rhinoceros beetle, Burrowing nematode; Ganoderma root rot, Grey blight
2. Banana: Banana weevil, banana aphids; Panama wilt. Bunchy top
3. Cashew: Tea mosquito bug. Cashew stem borer; Anthracnose, 2. Pink disease
4. Custard apple: Mealy bug, Fruit boring caterpillar; Anthracnose, Glomerella fruit rots.

Unit – 4: Pests and diseases of Commercial Flower crops

1. Rose: Rose aphid, Dieback, and black spot
2. Marigold: Aphids, leaf spot, and bud rot
3. Gerbera: Thrips, white flies and Blossom blight
4. Gladiolus: Cut worms, leaf eating caterpillar and corm rot.

Unit – 5: Management of Pests and Diseases

1. Principles and methods of plant disease management.
2. Integrated Plant disease management.
3. Fungicides classification based on chemical nature; commonly used insecticides, fungicides, bactericides and nematicides.
4. Preparation of fungicidal solutions, slurries, pastes and their application
5. Organic pesticides in disease control

Text books:

- **Chattopadhyay, T.K.1997.** Text book on Pomology (Fundamentals of fruit growing), Kalyani Publishers, Hyderabad.

- **Chundawat, B.S. 1990.** Arid Fruit Culture, Oxford and IBH, New Delhi.
- **Gourley J H 2009.** Text book of Pomology, Read Books Publ.

GOVERNMENT COLLEGE FOR WOMEN (A), GUNTUR

III B.Sc., – Horticulture –VI A / V Semester

Ornamental Horticulture

Total Hrs. of Teaching-Learning: 50 @ 3 h / Week Total Credits: 03

1. Learning Outcomes:

Students at the successful completion of the course will be able to:

- Acquire a critical knowledge of ornamental gardening and its significance.
- Identify and explain living and non-living components in an ornamental garden.
- Acquire skills on propagation and planting of various ornamental plants.
- Perform managerial skills related to ornamental gardening.
- Demonstrate skills of designing and developing ornamental gardens in public places.

2. **Syllabus:** (Hours: Teaching: 50, Lab: 30, Training: 05, others incl. unit tests: 05)
(*Syllabi of theory and practical together shall be completed in 80 hours*)

Unit -1: Introduction to Ornamental Horticulture (10h)

- History, Definition, scope of gardening, aesthetic values; types of gardens in India.
- Landscaping, basic principles and basic components.
- Principles of gardening, garden components and adornments.
- Lawn types, establishment and maintenance; methods of designing rockery and water garden.

Unit -2: Types of Ornamental gardens (10h)

1. Special types of gardens, trees, their design, their walk-paths, bridges, constructed features.
2. Garden structures – greenhouse, glass house, net house.
3. Values in landscaping; propagation-planting of shrubs and herbaceous perennials.

Unit-3: Plants in Ornamental gardens (10h)

1. Importance, design values, propagation, planting of following annuals, biennials and perennials:
(a) Climbers (b) Creepers (c) Palms (d) Ferns (e) Grasses (f) Cacti (g) Succulents

Unit-4: Ornamental gardening – public utility (10h)

1. Cultural operations in ornamental gardens.
2. Bio-aesthetic planning, definition, need; round country planning; urban planning and planting - avenues, educational institutions, and villages.
3. Beautifying railway stations, dam sites, hydroelectric stations, colonies, river banks, planting material for play grounds.

Unit-5: Ornamental gardening in residences (10h)

1. Bottle garden, terrariums.
2. Vertical gardens, roof gardens.
3. Culture of bonsai, art of making bonsai.

3. References:

- Chadha, K.L. and Chaudhary, B. 1986. Ornamental Horticulture in India. Publication and Information division. ICAR, New Delhi.
- K.V.Peter. 2009.Ornamental plants. New India Publishing Agency, New Delhi.
- Arora, J.S. 2006. Introductory Ornamental Horticulture. Kalyani Publishers, Ludhiana

- Bimaldas Chowdhury and Balai Lal Jana. 2014. Flowering Garden trees. Pointer publishers, Jaipur. India.

4. **Co-Curricular Activities** (student field training by teacher: 05 hours)**:**
    1. Mandatory:
        - **For Teacher**: Training of students by the teacher in the classroom or in the laboratory for a total of not less than 10 hours on garden operations, lawn making, art of bonsai, plant propagation methods; using CAD in landscaping.
        - **For Student**: Individual laboratory work and visit to parks in public and private places, studying the living and non-living elements of an ornamental garden – landscaping; culminating writing and submission of a hand-written Field Work Report (various plants, growth habit, propagation, design of garden) not exceeding 10 pages in the given method or format.
        - Max marks for Field Work Report: 05
        - Suggested Format for Field work Report *(not exceeding 10 pages*): Title page with student details, index page, objective, stepwise work done, findings, conclusions and acknowledgements.
        - Unit tests (IE).

GOVERNMENT DEGREE COLLEGE FOR WOMEN (A) GUNTUR

DEPARTMENT OF BOTANY & HORTICULTURE

III B. Sc - SEMESTER- V - HORTICULTURE

Course-7A: Commercial floriculture

(Skill Enhancement Course (Elective), Credits: 05 **Max Marks: 100**

I.Learning Outcomes:

Students at the successful completion of the course will be able to:

CO1: Identify and understand significance of flowers in human life

CO 2: Acquire skills skills related to production technique and analyze the breeding tecniques of some flowers

CO 3: Evaluate protected cultivation in floriculture and post harvest operations in floriculture

I.Syllabus: (Hours: Teaching: 50, Lab: 30, Field training: 05, others incl. unit tests: 05)

(S*yllabi of theory, practical and lab (skills) training together shall be completed in 80 hours*)

Unit-1: Basic concepts of floriculture (10h)

1. Aesthetic, cultural and industrial importance of flowers; domestic and export marketing of flowers.
2. Floriculture - Importance, area and production in Andhra Pradesh and India.
3. Scope and importance of commercial floriculture in A.P., and India.

Unit-2: Production technology-1 (10h)

1. Production techniques of following flowering plants for domestic and export market: (a) Rose (b) *Chrysanthemum* (c) Marigold (d) Tuberose (e) *Crossandra* (f) Jasmine

Unit-3: Production technology-2 (10h)

D. Production techniques of following flowering plants for domestic and export market: (a) *Anthurium* (b) *Gerbera* (c) *Gladiolus* (d) *Dahlia* (e) *Heliconia* (f) Orchid

Unit-4:Plant breeding of flowering ornamentals (10h)

1. Objectives and techniques in ornamental plant breeding.
2. Introduction, selection, hybridization, mutation and biotechnological technique for improvement of following ornamental and flower crops.
   - Carnation (b) *Petunia* (c) *Geranium* (d) *Cosmos* (e) *Hibiscus* (f) Snapdragon

Unit-5: Post-harvest practices in floriculture (10h)

1. Growing of flowering plants under protected environments such as glass house, plastic house, net house, etc.
2. Importance of flower arrangement; Ikebana - techniques, types, suitable flowers and cut foliage.
3. Post-harvest technology of cut and loose flowers in respect of commercial flower crops.
4. Dehydration techniques for drying of flowers, scope importance and status.

References:

1. T.K. Bose, L.P. Yadav, P. Patil, P. Das and V.A. Partha Sarthy.2003. Commercial flowers. Partha Sankar Basu, Nayaudyog,206, Bidhan Sarani, Kolkata
2. S.K. Bhattacharjee and L.C. De. 2003. Advanced Commercial Floriculture. Aavishkar Publishers, Distributors, Jaipur, India.
3. V.L. Sheela, 2008. Flower for trade. New India Publishing Agency, New Delhi
4. Dewasish Choudhary and Amal Mehta. 2010. Flower crops cultivation and management. Oxford Book Company, Jaipur, India.

Co-Curricular Activities (student field training by teacher: 05 hours**):**

(a) Mandatory:

- **For Teacher**: Training of students by the teacher in the classroom or in the laboratory for a total of not less than 10 hours on intercultural operations in floriculture, propagation techniques, breeding methods, post-harvest handling of flowers; floral designs and bouquet making.
- **For Student**: Individual laboratory work and visit to floriculture fields/floriculture department in a Horticulture University/college - studying the cultivation practices from sowing/planting to harvesting of flowers, post-harvest techniques - written Field Work Report (various flowering plants, propagation, utilization/marketing) not exceeding 10 pages in the given method or format.
- Max marks for Field Work Report: 05
- Suggested Format for Field work Report *(not exceeding 10 pages*): Title page with student details, index page, objective, stepwise work done, findings, conclusions and acknowledgements.
- Unit tests (IE).

(b) Suggested Co-Curricular Activities:

- Training of students by related industrial experts.
- Assignments (including technical assignments like identifying commercially important flowering plants, cultivation practices, propagation and breeding methods, post-harvest practices)
- Seminars, Group discussions, Quiz, Debates etc. (on related topics).
- Preparation of videos on intercultural operations, cultivation, shelf and vase-life, commercial products from flowers.
- Collection of material/figures/photos related to commercial floriculture in India and abroad, writing and organizing them in a systematic way in a file.
- Visits to Floriculture fields and Horticulture University/college.
- Invited lectures and presentations on related topics by field/industrial experts.

B.Sc	Semester – V (Skill Enhancement Course- Elective)	Credits : 1
Course: 7A	Commercial Floriculture Lab	Hrs/Wk :2

Learning Outcomes:

On successful completion of this practical course, student will be able to:

- Identify different flowering plants of commercial value.
- Perform skills in propagation of flowering plants.
- Demonstrate skills of post-harvest handling of flowers.
- Perform skills of floral arrangements or making floral products.

Practical (Laboratory) Syllabus: (30 hrs)

- Identification of commercially important floricultural crops.
- Propagation technique in *Hibiscus*/Rose/*Chrysanthemum*/tuberose.
- Propagation technique in *Gladiolus*/carnation/*Petunia*
- Sowing of seeds and raising of seedlings of a flowering plant.
- Training and pruning of rose/Jasminum.
- Drying and preservation of flowers.
- Use of chemicals and other compounds for prolonging the vase life of cut flowers.
- Flower arrangement practices.
- Preparation of bouquets, garland,veni and gajara.

Contact us @

botanygcwgunturt@gmail.com, botany@gcwguntur.ac.in

Call us @

8247092267

9985166449

9676609109

8500797338