BOTANY

GOVERNMENT COLLEGE FOR WOMEN(A) GUNTUR

COURSE 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**	

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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 Yor

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

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(4thEd.),*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

B.Sc.

THREE MAJOR

HORTICULTURE

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

B.Sc. THREE MAJOR HORTICULTURE

V Semester /Horticulture Core Course - 5
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.

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