

“Education for Knowledge, Science and Culture.”

– Shikshanmaharshi Dr. Bapuji Salunkhe

Shri Swami Vivekanand Shikshan Sanstha’s

**VIVEKANAND COLLEGE, KOLHAPUR (AUTONOMOUS)**



**Syllabus  
for  
Bachelor of Science**

**B.Sc. Part - III BOTANY  
(Semester- V & VI)**

**Under Choice Based Credit System**

**CBCS Syllabus to be implemented from 2020 – 2021**

(Subject to modifications in the future)



## CHOICE BASED CREDIT SYSTEM

### B.Sc. III (Sem. – V and VI) Botany

#### Course Structure

Paper No.	Course Code	Title of Paper	No. of Credits
<b>Semester V</b>			
V	DSE -1007E1	Cytology and Research Techniques in Life Sciences & Microbiology, Plant Pathology and Biofertilizers	04
	DSE -1007E2	Biochemistry and Stress Physiology & Plants Systematics and Paleobotany	04
	SECs(E)	Technique of Life Science	02
<b>Semester VI</b>			
VI	DSE-1007F1	Genetics and Plant Breeding & Biostatistics, Economic Botany and Ethnobotany	04
	DSE-1007F 2	Molecular Biology and Biotechnology & Horticulture, Forestry and Herbal Technology	04
	SECs(F)	Techniques in Plant Diversity & Crop Improvement	02



## CHOICE BASED CREDIT SYSTEM

### B.Sc. - III: Botany

#### Paper - V “Cytology and Research Techniques in Life Sciences & Microbiology, Plant Pathology and Biofertilizer”

(DSE – 1007 E1)

#### Section I: Cytology and Research Techniques in Life Sciences

**Course Outcomes: On completion of the course, students will be able to:**


CO1: Know the details of microscopy-principles of light microscopy, Electron microscopy (TEM&SEM), fluorescence microscopy.

CO 2: Perform chromatography technique.

CO 3: Know the details of micrometry, microphotography and electrophoresis.

CO 4: Know the radioactive isotopes and its importance.

Paper V	DSE 1007 E1 : “Cytology and Research Techniques in Life Sciences & Microbiology, Plant Pathology and Biofertilizer”  Section : I (DSE 1007E1): Cytology and Research Techniques in Life Sciences	No. of Hours per Unit / Credit
1.	<b>Cell as a unit of Life</b> 1a: The cell theory, Prokaryotic and Eukaryotic cells, Cell size and shape. 1b: Cell Membrane and cell wall 1c: The functions of membranes, Models of membrane structure. 1d: The fluidity of membranes, Membrane proteins and their functions, faces of the Membranes, selective permeability of the membrane cell wall.	10
2.	<b>Cell Organelles</b> 2a: Glyoxisomes, Peroxisomes and Lysosomes – Structure, composition and functions. 2b: Cell cycle 2c: Apoptosis.	08



3.	<b>Analytical Techniques in Plant Sciences.</b> 3a:Principles of Microscopy– Light Microscope, Fluorescence Microscopy, Electron Microscopy (TEM and SEM) 3b:Chromatography: Principles–Paper chromatography, TLC 3c:Micrometry, Microphotography, Electrophoresis	09
4	<b>Radiation Biology</b> 4a:RadioactiveIsotopes 4b: Effect of Radiations on Biological Systems. 4c: Beneficial Effect of Radiations. 4d: Autoradiography Technique 4e: Geiger–Muller Experiment /Liquid Scintillation Counter 4f:Precautionary measures	09

**References:**

- 1) Bajpai, P. K. Biological instrumentation and methodology. S.Chand and Co.Ltd, New Delhi.
- 2) Cotteril, R.(2002). Biophysics: An Introduction, John Wiley and sons.
- 3) Debajyoti Das. Biophysics and biophysical Chemistry. Academic Publishers, Kolkatta.
- 4) Dwivedi J.N., Singh, R.B.(1990).Essentials of plant Techniques. Scientific Publisher, Jodhpur.
- 5) Ruzin, S. E.(1999). Plant Microtechnique and Microscopy. Oxford University Press, New York, U.S.A



## CHOICE BASED CREDIT SYSTEM

### B.Sc. - III: Botany

#### Paper - V “Cytology and Research Techniques in Life Sciences & Microbiology, Plant Pathology and Biofertilizer”

(DSE – 1007 E1)

#### Section II: Microbiology, Plant Pathology and Biofertilizer

**Course Outcomes: On completion of the course, students will be able to:**

CO 1: Know the microorganisms in biological world.

CO 2: Become aware of applications of different microbes in various industries.

CO 3: Know the potential of these studies to become an entrepreneur.

CO 4: Equip themselves with skills related to laboratory as well as industries based studies.

Paper V	DSE 1007 E1 : “Cytology and Research Techniques in Life Sciences & Microbiology, Plant Pathology and Biofertilizer”  Section : II (DSE 1007E1): Microbiology, Plant Pathology and Biofertilizer	No. of Hours per Unit / Credit
1	<b>Microbiology</b> 1a:Methods in Microbiology 1b:Micro-organisms in Biological world 1c:Scope of Microbes in Industry and Environment	08
2	<b>Plant Pathology</b> 2a:Classification of plant diseases based on Pathogens, Crops and Symptoms. 2b:Study of Mechanism of Infection in Disease development(Biochemical changes),prevention and control of Plant Diseases. Role of Quarantine, Significance of Plant Pathology.	09
3	<b>Study of Plant Diseases</b> 3a: Cereals – Rust of Wheat 3b: Cash crop – Red Rot of Sugarcane 3c: Legume – Rust of Soybean, Mosaic of Bean 3d: Spices – Leaf spot of Turmeric 3e: Vegetable – White Rust of <i>Amaranthus</i> 3f: Fruit - Leaf curl of Papaya	09



4	<p><b>Bio fertilizer</b></p> <p>4a: Microbes in Agriculture – Biological Nitrogen Fixation, <i>Mycorrhizae</i>.</p> <p>4b: Organic Farming–Introduction, Concept and scope of Organic farming, Green Manuring , Bio compost Making Method</p>	10
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**References:**

- 1) Agrios G. N.(1997).Plant pathology. Academic Press, London.
- 2) Prescott L. M, Harley J. P.,Klein D. A.(2005).Microbiology, 6thEdition,McGraw Hill, India.
- 3) Pelezor M. J.and Chan E.C.S.(1972)Laboratory Exercies in Microbiology Mcgraw Hill Book co.
- 4) Rangaswami G.and Mahadevan A.(1999) .Diseases of crop plants in India. Prentice Hall. 4<sup>th</sup> ed. New Delhi..
- 5) Sharma P.D.(2011). Plant pathology, Rastogi publication, Merrut, India.



## CHOICE BASED CREDIT SYSTEM

### B.Sc. - III: Botany

#### Paper - V “Biochemistry and Stress Physiology & Plants Systematics and Pale botany”

(DSE – 1007 E2)

#### Section I: Biochemistry and Stress Physiology

**Course Outcomes: On completion of the course, students will be able to:**

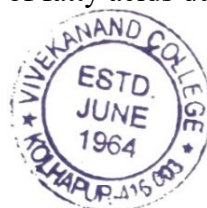
CO 1: Understand the properties and classification of carbohydrates and proteins.

CO 2: Understand the Beta oxidation, Gluconeogenesis and its role immobilization of fatty acids during germination.

CO 3: Understand the different types of plant stresses.

CO 4: Know the mechanism of senescence and aging in plants.

Paper V	DSE 1007 E2 : “Biochemistry and Stress Physiology & Plants Systematics and Pale botany” Section : I (DSE 1007E2): Biochemistry and Stress Physiology	No. of Hours per Unit / Credit
1.	<b>Plant Biochemistry.</b> <b>Carbohydrate metabolism.</b> 1a: Introduction and classification of Carbohydrates 1b: Properties of Monosaccharides, Oligosaccharides, Polysaccharides. 1c: Significance <b>Protein metabolism.</b> 1d: Introduction, properties and characters of aminoacids 1e: Protein-structure and classification 1f: Protein synthesis	12
2.	<b>Lipid metabolism and Fattyacid metabolism.</b> 2a: Introduction and classification of lipids. 2b: Properties of fattyacids (Stearic and Palmitic acid), and unsaturated fatty acids(Linoleic and Linolenic acid) 2c: Beta oxidation. 2d: Gluconeogenesis and role in mobilization of fatty acids during germination. 2e: Significance of lipids.	12



.	<b>Stress physiology.</b> 3a: Defining Plant stress. 3b: Types of stress:-Water stress-Salinity stress, High light stress, Temperature stress. 3c. Stress sensing mechanisms in plants, Calcium modulation, Phospholipid signaling.	<b>08</b>
<b>4</b>	<b>Senescence and Aging.</b> 4a: Patterns of senescence. 4b: Physical changes during senescence. 4c: Control of senescence.	<b>04</b>

**References:**

- 1) Buchanan B.B, Grussem W. and Jones R. L. (2000). Biochemistry and Molecular Biology of Plants. American society of Plant Physiologists, Maryland USA.
- 2) Dryer R. L. and Lata G.F.(1989). Experimental Biochemistry, Oxford University Press, New York.
- 3) Lea P. J. and Leegood R.C. (1999). Plant Biochemistry and Molecular Biology (2<sup>nd</sup> Edition). John Wiley and Sons. Chichester, England.
- 4) Malik and Shrivastava- Plant Physiology, S.Chand and Co., New Delhi.
- 5) Varma V.– A text book of Plant Physiology, S.Chand and Co., New Delhi.





## CHOICE BASED CREDIT SYSTEM

### B.Sc. - III: Botany

#### Paper - V “Biochemistry and Stress Physiology & Plants Systematics and Pale botany”

(DSE – 1007 E2)

#### Section II: Plants Systematics and Pale botany

**Course Outcomes: On completion of the course, students will be able to:**

CO 1: Know the concept of systematics.

CO 2: Know the phylogeny of angiosperms, a general account of origin of Angiosperms.

CO 3: Trace the history of development of systems of classification, emphasizing angiospermic taxa.

CO 4: Know the wide verities of angiosperm and trades in classification.

CO 5: Know the characters of economically important families of angiosperms.

Paper V	DSE 1007 E2 : “Biochemistry and Stress Physiology & Plants Systematics and Paleobotany”  Section : II (DSE 1007E2): Plants Systematics and Paleobotany	No. of Hours per Unit / Credit
1.	<b>Importance of Plant Systematics.</b> 1a:Introduction to Systematics, Evidences From Palenology, Cytology, Phytochemistry and Molecular data. 1b:Field inventory, Functions of Herbarium, Important Herbaria and Botanical gardens of the World and India.	12
2.	<b>System of Classification.</b> 2a:Phylogeny of Angiosperms,The general account of origin of Aniosperms (withr eference to Gnetalean theory) 2b:Classificationsy stem of Takhtajan, Brief reference of Angiosperm Phylogeny Group (APG-III) classification(2009). 2c: Ranks of IUCN and methods of Conservation.	08
3.	<b>PlantFamilies.</b> 3a:Morphological and floral characters, distinguishing characters and economic importance of following families. 3b:Anacardiaceae, Fabaceae, Apiaceae, Rubiaceae, Acanthaceae, Euphorbiaceae, Poaceae	08



4.	<b>Paleobotany.</b> 4a:General account types of fossils, Geological time scale. 4b:Study of following form genera with reference to systematic position, external morphology and affinities – <i>Lyginopteris</i> and <i>Enigmocarpon</i> 4c:Applications of Paleobotany-Role of microfossils in oil and coal exploration.	08
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#### References:

- 1) Davis P.H. and Haywood V. H.1963.Principles of angiosperm anatomy. Oliver and Royd, London.
- 2) Heywood, V. H.and Moore, D.M 1984.Current concepts in plant taxonomy. Academic Press, London.
- 3) Lowrence G. H. M.1951.Taxonomy of vascular plants. MacMillan, NewYork.
- 4) Naik, V.N.1984.Taxonomy of angiosperms.Tata Mc Graw Hill, NewYork.
- 5) Sporne K.R.1977. The morphology of Angiosperms. B. I. Publication, Bombay.



## CHOICE BASED CREDIT SYSTEM

### B.Sc. - III: Botany

#### Semester V: SEC (E)

#### Title: "Technique of Life Science"

#### Course Outcomes: On completion of the course, students will be able to:

CO 1: Familiar with various instrument & techniques used in labs.

CO 2: Familiar with different plant diseases & their management.

CO 3: Get to know the plant products used in agriculture and organic farming.

CO 4: Learn plant biochemistry.

#### Syllabus:

- 1) Study of Micrometry technique.
- 2) Study of the photo micrographs of cell organelle.
- 3) Cytological techniques-preparation of fixatives, preparation of stains (Acetocarmine and Acetoorcein)
- 4) To study the different types of microscope and its parts.
- 5) Study of Plant diseases as per theory
  - a) Rust of Wheat b) Red rot of Sugarcane c) Rust of Soybean d) Mosaic of Bean
- 6) Preparation of PDA (slants and plates) and Sterilization.
- 7) Study of fermentation by yeast.
- 8) Study of organic products- Jeevamruth, Dashparniark
- 9) To study various tools and instruments required in the lab-Autoclave, Laminarflow, Incubator, Waterbath, P<sup>h</sup> meter, Oven.



**Title: “Technique of Life Science”**

- 10) Qualitative test for sugar, starch and cellulose in plant material. (Any two test for each)
- 11) Qualitative test for proteins and lipids in plant material.(Any two test for each)
- 12) Separation of amino acid by circular paper chromatography.
- 13) Estimation of chlorophyll in leaf issue.
- 14) Comparative study of chlorophyll content in healthy and senescence leaf.
- 15) Study the pathway of phospholipid signaling and calcium modulation by photographs.

**References:**

- 1) Bajpai, P. K. Biological instrumentation and methodology S. Chand and Co.Ltd.
- 2) Pelezor M. J. and Chan E.C.S.)Laboratory Exercies in Microbiology, Mcgraw Hill Book co.
- 3) Sathe T. V. .Vermiculture and organic farming, Daya Publications.
- 4) Vayas S.C. and Vaya S.S and Modi H.A.(1998) -Biofertilizers and organic farming, Akta Prakashan Nadiad.



## CHOICE BASED CREDIT SYSTEM

### B.Sc. - III: Botany

#### Paper - VI “Genetics and Plant Breeding & Biostatistics, Economic Botany and Ethno botany”

(DSE – 1007 F1)

#### Section I: Genetics and Plant Breeding

#### Course Outcomes: On completion of the course, students will be able to:

CO 1: Know the Mendelian genetics and basic laws of inheritance.

CO 2: Know the phenomenon of dominance, laws of segregation, and independent assortments of genes.

CO 3: Understand the phenomenon of linkage and crossing over.

CO 4: Know the genomic organization in plants.

CO 5: Understand the different techniques of plant breeding.

Paper VI	DSE 1007 F1 : “Genetics and Plant Breeding & Biostatistics, Economic Botany and Ethnobotany”  Section : I (DSE 1007F1): Genetics and Plant Breeding	No. of Hours per Unit / Credit
1	<b>Heredity</b> 1a:Introduction, Terminologies, Laws of Inheritance (Monohybrid and Dihybrid) 1b:Multiple Allelism.	09
2	<b>Linkage and Crossing over</b> 2a: Linkage- Concept and History, Types of Linkage 2b:Crossingover- Concept and Significance, Cytological proof crossing over. 2c:Linkage Maps	08
3	<b>Extra–Chromosomal Genome</b> 3a: Introduction and Organization of genome 3b: Plastid Inheritance 3c: Mitochondrial Inheritance	06
4	<b>Plant Breeding</b> 4a: Introduction and objectives, Plant genetic resources, Centers of origin and Domestication of crop plants. 4b: Methods of crop improvements. Methods of Breeding,	13



	Selection methods for self-pollinated, cross pollinated and vegetative propagated plants. Mutation breeding	
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### References:

- 1) Acquaah, G. (2007). Principles of Plant Genetics and Breeding. Black well Publishing.
- 2) Chaudhari, H.K. (1984). Elementary Principles of Plant Breeding. Oxford IBH. 2<sup>nd</sup> edition.,
- 3) Gardner E.J., Simmons M.J. and Snustad D.P. (2008). Principles of Genetics. 8<sup>th</sup> Ed. Wiley, India.
- 4) Snustad, D. P. and Simmons, M. J. (2010). Principles of Genetics. John Wiley and Sons nc., India 5<sup>th</sup> Edition.
- 5) Singh, B.D. (2005). Plant Breeding: Principle sand Methods. Kalyani Publishers, 7<sup>th</sup> Edition. Lucknow.



## CHOICE BASED CREDIT SYSTEM

### B.Sc. - III: Botany

#### Paper - VI “Genetics and Plant Breeding & Biostatistics, Economic Botany and Ethno botany”

(DSE – 1007 F1)

#### Section II: Biostatistics, Economic Botany and Ethno botany

**Course Outcomes: On completion of the course, students will be able to:**

CO 1: Know the biostatistics and statistical terms.

CO 2: Know the method of sampling and representation of data.

CO 3: The role of plants in human welfare.

CO 4: Gain the knowledge about various plants of economic use and importance of plant and plant products.

Paper VI	DSE 1007 F1 : “Genetics and Plant Breeding & Biostatistics, Economic Botany and Ethno botany”  Section : II (DSE 1007F1): Biostatistics, Economic Botany and Ethno botany	No. of Hours per Unit / Credit
1	<b>Biostatistics</b> 1a:Introduction, Statistical Terms. 1b:Sampling-Sampling Methods. 1c:Collection and Representation of data (Diagrammatic and Graphic representation) 1d:Measures of Central Tendency -Mean, Mode and Median 1e:Variances and standard deviation, Coefficient of variation. 1f:Test of Significance(T- test),Chi-square test (X <sup>2</sup> test)	10
2	<b>Economic Botany-I</b> 2a:Study of following economical important plant with reference to origin, morphology, parts used and uses. 2b:Cereals- Jowar and Rice 2c:Legumes– Soybean and <i>Vigna</i> 2d:Vegetables– <i>Amaranthus</i> / Chilly 2e:Spices-Clove and blackpepper	09
3	<b>Economic Botany- II</b> 3a:Beverages-Tea and Coffee 3b:Fiber Yielding Plants-Cotton and <i>Hibiscus cannabinis</i> 3c:Oil yielding <i>Pongamia pinnata</i> and Sunflower 3d:Dye : <i>Bixa</i> and <i>Lawsonia</i>	08



4	<p><b>Ethnobotany</b>  4a: Introduction, Concept and Scope  4b: Ethnobotanical studies with reference to data collection- Field work, Herbarium, Ancient literature, Archaeological findings, Sacred groves.  4c: Role of ethnobotany in modern medicine- <i>Adathoda vasica</i>, <i>Tinospora cordifolia</i>, <i>Curcuma longa</i> and <i>Tribulus terrestris</i></p>	09
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### References:

- 1) Chrispeels, M. J. and Sadava, D. E.(1994). Plants, Genes and Agriculture. Jones and Bartlett Publishers.
- 2) Gupta, P .K.(1994). Genetics. Rastogi Publications, Shivaji Road, Meerut.
- 3) Klug, W. S., Cummings, M. R., Spencer, C.A.(2009). Concepts of Genetics. Benjamin Cummings, USA. 9thEd.
- 4) Sharma ,J. R.(1994). Principles and Practice of Plant Breeding. Tata McGraw Hill Publishing Co.Ltd, New Delhi.





## CHOICE BASED CREDIT SYSTEM

### B.Sc. - III: Botany

#### Paper - VI “Molecular Biology and Biotechnology & Horticulture, Forestry and Herbal Technology”

(DSE – 1007 F2)

#### Section I: Molecular Biology and Biotechnology

**Course Outcomes: On completion of the course, students will be able to:**

CO 1: Know the scope and importance of molecular biology.

CO 2: Gain knowledge about the mechanism and essential component required for the DNA replication.

CO 3: Know the fundamentals of Recombinant DNA technology.

CO 4: Gain the knowledge of genetic engineering.

CO 5: Know the principles and basic protocols of plant tissue culture.

Paper VI	DSE 1007 F2 : “Molecular Biology and Biotechnology & Horticulture, Forestry and Herbal Technology” Section : I (DSE 1007F2): Molecular Biology and Biotechnology	No. of Hours per Unit / Credit
1	<b>Genetic Material</b> 1a:NucleicAcids(DNA, RNA) 1b:Griffth’sandAvery’strans formation experiment, Harshey-Chase bacteriophage experiment 1c:DNAstructure and Types of DNA 1d:DNA replication 1e:Types of RNA	09
2	<b>Recombinant DNA Technology</b> 2a:Introduction and Principle 2b:Enzymes involved in recombinant DNA technology 2c:Cloning Vectors (Plasmid, Bacteriophage and Cosmids) 2d:Gene Amplification:PCR techniques	09
3	<b>Genetic Engineering</b> 3a:Introduction 3b:Methodofgenetransfer- <i>Agrobacterium</i> mediated, Directgene transfer by Electroporation, Microinjection, Microprojectile bambardment	09



	3c:Transgenic Plants ( <i>Bt</i> Cotton and Golden Rice) 3d:Applications of Genetic transformation 3e:BlottingTechniques-Northern, Southern and DNA Fingerprinting	
4	<b>Plant Tissue Culture</b> 4a:Principle and Totipotency 4b:Components of culture media, Sterilization techniques 4c:Techniques inTissue culture (Callus culture and Cell suspension) 4d:Organogenesis, Embryogenesis 4e:Anther culture 4f:Applications of Plant Tissue Culture	09

### References:

- 1) Bhojwani S.S and Razdan M.K.(1996). Plant Tissue Culture.Theory and Practice. Elsevir Science Amsterdam. The Netherlands.
- 2) Glick B. R; Pasternak J.J.(2003).Molecular Biotechnology-Principles and Applications of Recombinant DNA,ASM Press,Washington.
- 3) Rusell,P. J.(2010). Genetics- A Molecular Approach. Benjamin Cummings, U.S.A.3<sup>rd</sup>edition.
- 4) Snustad D. P.and Simmons M.J.(2010).Principles of Genetics. John Wiley and Sons Inc.,U.S.A 5<sup>th</sup>edition.
- 5) Watson J. D; Baker T. A; Bell S.P;Gann A; Levine M; Losick R.(2007) Molecular Biology of the gene,Pearson Benjamin Cummings, CSHL Press, New York, U.S.A.



## CHOICE BASED CREDIT SYSTEM

### B.Sc. - III: Botany

#### Paper - VI “Molecular Biology and Biotechnology & Horticulture, Forestry and Herbal Technology”

(DSE – 1007 F2)

#### Section II : Horticulture, Forestry and Herbal Technology

**Course Outcomes: On completion of the course, students will be able to:**

CO 1: Know the science of horticulture and methods of propagation of horticultural plants.

CO 2: Know how to manage a good nursery.

CO 3: Gain the basic knowledge of forestry and its products.

CO 4: Know different methods of herbal technology.

<b>Paper VI</b>	<b>DSE 1007 F2 : “Molecular Biology and Biotechnology &amp; Horticulture, Forestry and Herbal Technology”</b> <b>Section : II (DSE 1007F2): Horticulture, Forestry and Herbal Technology</b>	<b>No. of Hours per Unit / Credit</b>
<b>1</b>	<b>Horticulture</b> 1a:Introductionandimportance 1b:Methods of Propagation and Asexual and Sexual 1c:PlantNursery–Introduction, Types of Nursery Infrastructure and requirement Use of Fertilizers and Pesticides Commercial importance	<b>09</b>
<b>2</b>	<b>Gardening and Ornamental Plants</b> 2a:Gardening- Definition, Objective, Types of Gardening, Importance and Landscape garden 2b:Ornamental Plants: Herbs, Shrubs, Trees, Indoor plants, Lawn and Climber	<b>09</b>
<b>3</b>	<b>Forestry</b> 3a:Introduction, Forest types of India 3b:Wild life and Biosphere reserves 3c:Social and Agricultural Forestry 3d:Forest research education and Training institutions 3e:Forest Acts 3f: Different Plant as a forest products.	<b>10</b>



4	<b>Herbal Technology</b> 4a:Pharmacognosy-Definition and Techniques 4b:Phytochemicals–Alkaloids and Phenols 4c:Drug- types and adulteration 4d:Scope of Pharmacognosy	08
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**References:**

- 1) Bose T.K and Mukherjee D,Gardening in India, Oxford and IBH Publishing Co, New Delhi
- 2) Kumar N., Introduction to Horticulture, Rajalakshmi Publications. Nagercoil.
- 3) Edmond Musser and Andres, Fundamentals of Horticulture. Mc Graw Hill Book Co, New Delhi.
- 4) Chopra R.N, Nayar S. L. and Chopra C., Glossary of Indian Medicinal Plants, C.S.I.R, New Delhi.



## CHOICE BASED CREDIT SYSTEM

### B.Sc. - III: Botany

#### Semester V: SEC (F)

#### Title: “Techniques in Plant Diversity and Crop Improvement”

**Course Outcomes: On completion of the course, students will be able to:**

CO 1: Familiar with identification, classification & nomenclature of plants.

CO 2: Familiar with conservation of useful & endangered plants.

CO 3: Learn breeding techniques for improvement of crop diseases.

CO 4: Get employment opportunities to studying different horticultural technique.

#### “Techniques in Plant Diversity and Crop Improvement”

- 1) Identification of genus and species with the help of Cook’s Flora.
- 2) Study of pollen viability and pollen germination.
- 3) Study of herbarium technique.
- 4) Method of emasculation and bagging(demonstration only)
- 5) Study of breeding technique in suitable material(Malvaceae/ Fabaceae/Poaceae)
- 6) Common plants use for ethno botanical purpose by Tribals.
- 7) Economic botany: a)Cereals, Legumes, Vegetables, b)Spices, Beverages, Dye  
c)Fiber and oil yielding plants
- 8) Ethnic food crops
- 9) Ethnoveterinary medicine.
- 10) Study of implements used in Nursery and gardening.



**Title: “Techniques in Plant Diversity and Crop Improvement”**

- 11) Propagation by layering/ Grafting.
- 12) Identification and description of Herbs(Annuals),Perennials(Shrubs,Trees).
- 13) Identification and description of climbers, creepers, indoor plants andl awns.
- 14) Study of forest products.
- 15) Study of Biodiversity ,composition of different types of forests in India  
(Tropical, subtropical and Temperate).

**References:**

- 1) Bose T. K and Mukherjee D, Gardening in India, Oxford and IBH Publishing Co, New Delhi
- 2) Capon B., Botany for Gardeners. 3<sup>rd</sup>Edition.Timber Press Portl and,Oregon.
- 3) Sporne K. R. The morphology of Angiosperms. B. I. Publication, Bombay.
- 4) Kumar N.,Introduction to Horticulture, Rajalakshmi Publications. Nagercoil.
- 5) Randhawa G. S.and Mukhopadhyay A., Horticulture in India, Allied Publishers, New Delhi.



## CHOICE BASED CREDIT SYSTEM

**B.Sc. - III: Botany**

**Practical Syllabus**

<b>Practical: I</b>	<b>(DSE7E1)</b>	<b>Section :I</b>	<b>Cytology and Research Techniques in Life Sciences</b>
		<b>Section: II</b>	<b>Microbiology, Plant Pathology and Bio fertilizers</b>
<b>Practical: II</b>	<b>(DSE7E2)</b>	<b>Section: I</b>	<b>Plant Biochemistry and Stress physiology</b>
		<b>Section: II</b>	<b>Plant systematic and Paleobotany</b>
<b>Practical: III</b>	<b>(DSE7F1)</b>	<b>Section : I</b>	<b>Genetics and Plant Breeding</b>
		<b>Section: II</b>	<b>Biostatistics, Economic Botany and Ethnobotany</b>
<b>Practical: IV</b>	<b>(DSE7F2)</b>	<b>Section: I</b>	<b>Molecular Biology and Biotechnology</b>
		<b>Section: II</b>	<b>Horticulture, Forestry and Herbal Technology</b>



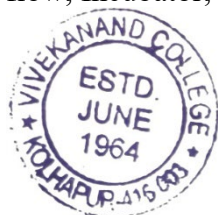
## CHOICE BASED CREDIT SYSTEM

### B.Sc. - III: Botany

#### Practical - I

#### Based on Section I and Section II of DSE E1

- 1) Study of Micrometry technique.
- 2) To study of prokaryotic cell (Bacteria), viruses, eukaryotic cell with the help of electron micrograph.
- 3) Study of the photomicrographs of cell organelle.
- 4) Study of special chromosome (Polytene and Lampbrush) either by slides or photographs.
- 5) Separation and identification of amino acid by TLC.
- 6) Onion peel to study the plant cell.
- 7) Cytological techniques – preparation of fixatives, preparation of stains (Acetocarmine and Acetoorcein)
- 8) To study the different types of microscope and its parts.
- 9) To study principles and applications of Spectrophotometer, Calorimeter, Electrophoresis, Liquid Scintillation counting.
- 10-12) Study of Plant diseases as per theory
  - a) Rust of Wheat      b) Red rot of Sugarcane      c) Rust of Soybean
  - d) Wilt of Gram      e) Leaf spot of Turmeric / Leaf spot of Peeper
  - f) White rust of *Amaranthus*      g) Leaf curl of Papaya
- 13) Preparation of PDA (slants and plates) and Sterilization.
- 14) Inoculation of Fungi on slants and plates.
- 15) Isolation and separation of soil fungi by dilution method.
- 16) Study of fermentation by yeast.
- 17) Staining technique - Gram's staining.
- 18) Study of important stains of microbiology.
- 19) Study of typical virus (Plant virus, Bacteriophage) by using photograph.
- 20) Study of Bio fertilizers – *Nostoc*, *Trichoderma*, *Anabaena*, *Rhizobium*, VAM.
- 21) Study of organic products- Jeevamruth, Dashparniark
- 22) To study various tools and instruments required in the lab- Autoclave, Laminar flow, Incubator, Water bath, P<sup>h</sup> meter, Oven.





## CHOICE BASED CREDIT SYSTEM

### B.Sc. - III: Botany

#### Practical - II

#### Based on Section I and Section II of DSC E2

1. Qualitative test for sugar, starch and cellulose in plant material. (Any two test for each)
2. Qualitative test for proteins and lipids in plant material. (Any two test for each)
3. Determination of fatty acid value of oil sample.
4. Estimation of proteins from plant samples by biuret method
5. Separation of amino acid by circular paper chromatography.
6. Estimation of chlorophyll in leaf tissue.
7. Comparative phytochemical studies in healthy and stressed plants.
9. Comparative study of chlorophyll content in healthy and senescence leaf.
10. Study the pathway of phospholipid signaling and calcium modulation by photographs.
11. to 16. Study of following plant families.
  - a) Anacardiaceae
  - b) Fabaceae
  - c) Apiaceae
  - d) Rubiaceae
  - e) Acanthaceae
  - e) Euphorbiaceae
  - f) Poaceae
17. Study of types of fossils :Impression, Compression, Pterification, Cast, Coalball, Amber.
18. Study of fossil genera- *Enigmocarpon*, *Lyginopteris*
19. Identification of genus and species with the help of Cook's Flora.
20. Study of pollen viability and pollen germination
21. Study of herbarium technique.



## CHOICE BASED CREDIT SYSTEM

### B.Sc. - III: Botany

#### Practical - III

#### Based on Section I and Section II of DSE F1

1. Genetic examples- Mendalian Laws.
2. Genetic examples- linkage and cross-over.
3. Genetic examples- Polygen inheritance.
4. Study of meiosis in Allium and prepaton of permanat cytological slide.
5. Preparation of karyotypes- Preparation of ideogram by using photogrpbes.
6. Study of various stages of mitosis in root tip cells.
7. Genetic examples on multiple alleles.
8. Camera Lusida drawing.
9. Method of emasculation and bagging (demonstration only)
10. -12 Study of breeding technique in suitable material (Malavaceae/ Fabaceae/ Poaceae)
13. Measure of central tendency of giving data.
14. Analysis of the giving data using computer/ study of frequency distribution and its graphicspresentation.
15. Common plant use for ethanobotanical purpose by Tribals.
16. Documentation technique of Ethenobotany.
- 17) to 19) Economic botany. a) Cereals, Legumes, Vegetables    b) Spices, Beverages, Dye  
    c) Fiber and oil yielding plants
- 20) Ethnic food crops
- 21) Ethno veterinary medicine.



## CHOICE BASED CREDIT SYSTEM

### B.Sc. - III: Botany

#### Practical - IV

##### Based on Sec I and Sec II of DSC F2

- 1) Familiarization with basic equipment's in tissue culture.
- 2) Preparation of tissue culture medium (MS) and its sterilization.
- 3) to 5) Demonstration techniques of in vitro sterilization and inoculation methods using suitable explants.
- 6) Study of methods of gene transfer through photographs.
- 7) Study of steps of genetic engineering for the production of Bt cotton, Golden rice through photographs.
- 8) Study of molecular techniques – PCR, Blotting techniques.
- 9) Study through photographs – anther culture, somatic embryogenesis, endosperm and embryoculture, micropropagation.
- 10) Study of implements used in Nursery and gardening.
- 11) Propagation by layering.
- 12) to 13) Propagation by grafting
- 14) Identification and description of Herbs (Annuals), Perennials (Shrubs, Trees).
- 15) Identification and description of climbers, creepers, indoor plants and lawns.
- 16) Study of forest products.
- 17) Chemical tests for Tannin (*Terminalia chebula*) and Alkaloid (*Catharanthus roseus*).
- 18) Detection of adulterants of market samples of mustard seeds, coriander powder, pepper, teadust, coffee powder, chilli powder, turmeric powder.
- 19) Study of Biodiversity, composition of different types of forests in India.(Tropical,subtropical and Temperate).
- 20) Sources, properties and uses of fibres and paper.
- 21) Preparation of Vermicompost.
- 22) Visit to Nursery.



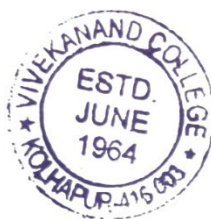
## CHOICE BASED CREDIT SYSTEM

### B.Sc. III (Sem. V & VI) Botany

#### Evaluation Pattern

With effect from 2020-21

Semester	Title of the paper	Course Code	Semester End Examination	Continuous Internal Evaluation Marks	Total Marks
V	Cytology and Research Techniques in Life Sciences & Microbiology, Plant Pathology and Biofertilizers	DSE 1007E1	40	10	50
V	Biochemistry and Stress Physiology & Plants Systematics and Paleobotany	DSE1007E2	40	10	50
VI	Genetics and Plant Breeding & Biostatistics, Economic Botany and Ethnobotany	DSE1007F1	40	10	50
VI	Genetics and Plant Breeding & Biostatistics, Economic Botany and Ethnobotany	DSE1007F2	40	10	50



**CHOICE BASED CREDIT SYSTEM**  
**B.Sc. III (Sem. V & VI) Botany**  
**Semester End Examination**  
**Structure of Question Paper**

**Total Marks: 35**

**Time : 2 hours**

Question No.	Question Pattern	Marks
Q.1	Select correct alternative. (MCQ).	08
Q.2	Attempt any two. (Long answer questions).	16
Q.3	Attempt any four. (Short notes).	16
	Total	40

**B.Sc. III (Sem. V & VI) Botany**  
**Continuous Internal Evaluation (CIE)**

Evaluation Type	Marks
Home Assignment/Book Review/ Student Project/Test/PPT Presentation	10

