

**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**



NAAC Accredited-2015  
'B' Grade (CGPA 2.62)

**Name of the Faculty: Science & Technology**

**CHOICE BASED CREDIT SYSTEM**

**Syllabus: Botany**

**Name of the Course: B. Sc. Part- III (Sem. V & VI)**

**(Syllabus to be implemented from w.e.f. June 2021)**

## Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science- New Choice Based Credit System (CBCS) [w.e.f. 2021-22]

### Draft Structure for B.Sc. Part- III

Subject/ Core Course	Name and Type of the Paper	No. of papers/ Practical	Hrs/week			Total Marks Per Paper	UA	CA	Credits
	Name		L	T	P				
<b>Class:</b>	<b>B.Sc. Part- III Semester- V</b>								
<b>Ability Enhancement Course (AECC)</b>	<b>English (Business English)</b>	Paper- III	4.0	--	--	100	80	20	4.0
<b>Discipline Specific Elective (DSE)</b> (Students can opt any one) Subjects among the three Subjects excluding interdisciplinary offered at B.Sc. Part- II.	<b>DSE- 1A Plant Systematics</b>	Paper- IX	3	--	--	100	80	20	4.0
		Paper -X	3	--	--	100	80	20	4.0

	<b>Genetics</b>								
	<b>DSE- 3 A</b>								
	<b>Molecular Biology</b>	Paper- XI	3	--	--	100	80	20	4.0
	<b>DSE 4 A</b>	Paper- XII							
	<b>Plant Breeding</b>	Paper- XII	3	--	--	100	80	20	4.0
	<b>Economic Botany</b>	Paper- XII							
	<b>(Add-on-self learning)- MOOC/Swayam Course/Internship/ College run skill development courses</b>		--	--	--	--	--	--	4.0
<b>Grand Total</b>			<b>16.0</b>	<b>--</b>	<b>--</b>	<b>500</b>	<b>400</b>	<b>100</b>	<b>24</b>
<b>Class:</b>	<b>B.Sc. Part- III Semester- VI</b>								
Ability Enhancement Course (AECC)	<b>English (Business English)</b>	Paper IV	4.0	--	--	100	80	20	4.0
<b>DSE</b> (Students can opt any one subjects among the three Subjects excluding interdisciplinary offered at B.Sc.II.	<b>DSE- 1B</b>								
	<b>Plant Pathology</b>	Paper - XIII	3.0	--	--	100	80	20	4.0
	<b>DSE- 2B-</b>								
	<b>Plant Biotechnology</b>	Paper- XIV	3.0	--	--	100	80	20	4.0
	<b>DSE- 3B-</b>								
	<b>Cell Biology</b>	Paper- XV	3.0	--	--	100	80	20	4.0
	<b>DSE 4B-</b>								
	<b>Nursery, Gardening &amp; Horticulture</b>	Paper- XVI	3.0	--	--	100	80	20	4.0

	<b>DSE 4B- Biostatistics</b>	Paper XVI	3.0	--	--	100	80	20	4.0
<b>Total (Theory)</b>			<b>16. 0</b>	--	--	<b>500</b>	<b>400</b>	<b>100</b>	<b>20</b>
<b>DSE - Practical (AnnualExam)</b>	<b>DSE- 1 A &amp; B</b>	Practical- IX & XIII	--	--	5	100	80	20	4.0
	<b>DSE -2 A &amp; B</b>	Practical- X&XIV	--	--	5	100	80	20	4.0
	<b>DSE- 3 A &amp; B</b>	Practical- XI&XV			5	100	80	20	4.0
	<b>DSE- 4 A &amp; B</b>	Practical- XII & XVI			5	100	80	20	4.0
<b>Total (Practical's)</b>					<b>20</b>	<b>400</b>	<b>320</b>	<b>80</b>	<b>16</b>
<b>Grand Total</b>			<b>32. 0</b>		<b>20</b>	<b>1400</b>	<b>1120</b>	<b>280</b>	<b>60</b>

**Summary of the Structure of B.Sc. Programme  
as per CBCS pattern**

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Class	Semester	Marks-Theory	Credits-Theory	Marks-Practical	Credits-Practical's	Total – credits
<b>B.Sc.-I</b>	I	500	20	--	--	20
	II	550	20	400	16	36
<b>B.Sc.-II</b>	III	350	14	--	--	14
	IV	350	14	300	12	26
<b>B.Sc.-III</b>	V	500	24	--	--	24
	VI	500	20	400	16	36
<b>Total</b>		2750	110	1100	44	156

**B.Sc. Programme:**

**Total Marks :** Theory + Practical's = 2750 + 1100 = 3950

**Credits :** Theory + Practical's = 110 + 44 = 154

**Numbers of Papers:** Theory: Ability Enhancement Course (AECC) 05  
Theory: Discipline Specific Elective Paper (DSE) 08  
Theory: DSC 12  
Skill Enhancement Courses/Addon 01  
**Total:** Theory Papers 31  
Practical Papers 11

**Abbreviations:**

L: Lectures

P: Practical's

CA: College Assessment

AEC: Ability Enhancement Course

SEC: Skill Enhancement Course

CA: Continuous Assessment

T: Tutorials

UA: University Assessment

DSC/CC: Core Course

DSE: Discipline Specific Elective Paper

GE: Generic Elective

ESE: End Semester Examination

## Semester- V

### PLANT SYSTEMATICS

#### Paper- IX

Credits: Theory- 4, Practical-2

Lectures:35

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#### Unit 1: Descriptive Terminology

(12 Lectures)

: Habitat.

: Habit and lifespan.

Roots- Types and modification.

: Stems- Types and modification.

: Leaves- Types and modification.

: Inflorescence- Racemose types, Cymose types, Specialized types.

1.7: Flower- Calyx, Corolla, Perianth, Androecium, Gynoecium.

1.8: Fruit- Simple fruits, Aggregate fruits, Multiple fruits.

1.9: Floral formula and Floral diagram.

#### Unit 2: Species Concept, Identification and Nomenclature

(4 Lectures)

: Species definition and Species concept

(Typological, Non-dimensional Multi-dimensional species concept).

: Identification of plants.

: Nomenclature, Binomial nomenclature of plants.

2.4: Principles of ICBN.

#### Unit 3: Herbarium and Botanical Garden

(4 Lectures)

: Herbarium- Steps in preparation and significance.

: Botanical gardens of India- Sir J. C. Bose Botanical Garden, Calcutta & Lead Botanical Garden of Shivaji University Kolhapur.

#### Unit 4: Systems of Classification

(5 Lectures)

: Outline of Bentham and Hookers system of classification. Merits and demerits of Bentham and Hookers system of classification.

Outline of APG III system of classification of Angiosperm Phylogeny Group.

4.3: Merits and Demerits of APG III system of classification.

**Unit 5: Families of Angiosperms**

**(10 Lectures)**

5.1 Study of following Angiosperms families; follow the Bentham & Hookers System of classification.

- |                  |                  |                |
|------------------|------------------|----------------|
| 1. Annonaceae    | 2. Malvaceae     | 3. Rutaceae    |
| 4. Rubiaceae     | 5. Bignoniaceae  | 6. Lamiaceae   |
| 7. Nyctaginaceae | 8. Polygoniaceae | 9. Orchidaceae |
| 10. Poaceae.     |                  |                |

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**Suggested Readings-**

1. Cooke, T. 1901–1908. *The Flora of The Presidency of Bombay*. London. (B.S.I. Reprint). Calcutta, Vols. I, II & III, 1958.
  2. Gaikwad, S. P. & Garad K. U. 2016. *Flora of Solapur District*. Laxmi Book Publication, Solapur.
  3. Singh, N. P. & Karthikeyan, S. (edt.) 2000. *Flora of Maharashtra State, Dicotyledones*. vol. I & II Botanical Survey of India, Calcutta.
  4. Gurucharan S. 2010. *Plant Systematics- Theory and Practice*. Science Publishers, Enfield, NH, USA an imprint of Edenbridge Ltd., British Channel Islands Printed in India.
  5. Naik V. N. 2005. *Taxonomy of Angiosperms*. Tata McGraw- Hill Publishing Company Limited, New Delhi.
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# GENETICS

**Paper- X**

**Credits: Theory- 4, Practical-2**

**Lectures:35**

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## **Unit1:Heredity**

**(8Lectures)**

- : Introduction to genetics.
- 1.2: Brief life history of Mendel.
- 1.3: Terminologies.
- : Mendel's Laws of Inheritance:
  - A) Law of dominance,
  - B) Law of segregation,
  - C) Law of independent Assortment.
- 1.5: Back cross, Testcross.
- 1.6. Gene Interaction.

## **Unit 2: Linkage and Crossingover**

**(8Lectures)**

- : Linkage: concept & history
- : Complete & Incomplete linkage, Bridges experiment.
- 2.3: Coupling & Repulsion, recombination frequency.
- : Linkage maps based on two and three factor crosses.
- : Crossing over: concept and significance, cytological proof of crossing over.

## **Unit 3: Sex-determination and Sex-linked Inheritance**

**(7Lectures)**

- 3.1: Autosomes and sex chromosomes.
- 3.2: Mechanism of sex determination.
- 3.3: Sex chromosomes in *Drosophila*.
- 3.4: Sex chromosomes in man.
  - : Balance concept of sex determination in *Drosophila*- Bridge's Experiment.
  - : Sex linked inheritance in man:
    - a) Colour blindness.
    - b) Haemophilia.



c) Holandricgene

#### **Unit 4: Quantitative inheritance**

**(6 Lectures)**

: Quantitative traits, continuous variation.

: Polygenic trait in corolla length in *Nicotiana*, cob length in *Zeamays*.

: Population genetics. Hardy –Weinberg's law, Factors affecting on gene and gene frequencies.

#### **Unit 5: Cytoplasmic inheritance**

**(6 Lectures)**

: Mitochondrial and Chloroplast genome.

: Inheritance of chloroplast genes (*Mirabilis jalapa* and *Zeamays*).

: Inheritance of mitochondrial genes (Petite in Yeast and cytoplasmic male sterility in plants).

: Interaction between cytoplasmic and nuclear gene.

5.5: Maternal effect in inheritance.

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#### **Suggested Readings-**

1. Plant Chromosomes: Analysis Manipulation and Engineering. Hawood Sharma A K and Sharma A. 1999: Academic Publishing Co. Australia.
  2. Principles of Gene Manipulation. Old R. W. and Primrose, S. B. 1989 Blackwell Scientific Publications. Oxford UK.
  3. Genetics: M. L. Shrivastav, Shri Publishers and Distributors, Ansari Road New Delhi, 110002.
  4. Genetics, P. K. Gupta, Rastogi Publications, Meerut, 250002.
  5. Genetics and Evolution, H. S. Bhamrah, Kavita Juneja, Anmol Publications, Pvt. Ltd. New Delhi, 110002
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# MOLECULAR BIOLOGY

## Paper- XI

Credits: Theory- 4, Practical-2

Lectures:35

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### Unit 1: Nucleic acids

(5 Lectures)

- : Introduction.
- : Historical perspective.
- : DNA as the carrier of genetic information (Griffith's experiment).

### Unit 2: The Structures of Genetic Material

(7 Lectures)

- : Introduction.
- : Structure of DNA: Watson and Crick model.
- 2.3: Salient features of double helix.
  - : Types of DNA.
  - : Denaturation and renaturation of DNA.
- : Organization of DNA in Prokaryotes and Eukaryotes.
- 2.7: Structure of RNA.
- 2.8: Types of RNA.

### Unit 3: Replication of DNA

(7 Lectures)

- : Introduction.
- : Synthesis of DNA (Kornberg's discovery).
- : Replication of DNA in prokaryotes and eukaryotes.
- 3.4: Enzymes involved in DNA replication.

### Unit 4: Transcription

(8 Lectures)

- : Introduction.
- : Transcription in prokaryotes and eukaryotes.
- : Principles of transcriptional regulation.
  - : Prokaryotes: Regulation of lactose metabolism in *E. coli*.
  - : Eukaryotes: transcription factors, heat shock proteins, steroids and peptide hormone.

## Unit 5: Translation (08lecture)

:Introduction.

: Structure of Ribosome.

: Assembling of Ribosome and m-RNA.

: Charging of t-RNA and aminoacyl t-RNA synthetases.

5.5: Steps in protein synthesis

: Proteins involved in initiation, elongation and termination of polypeptides.

: Post-translational modifications of proteins.

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### Suggested Readings-

1. 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. 6th edition.
  2. Snustad, D. P. and Simmons, M. J. (2010). Principles of Genetics. John Wiley and Sons Inc., U. S. A. 5<sup>th</sup> edition.
  3. Klug, W. S., Cummings, M. R., Spencer, C. A. (2009). Concepts of Genetics. Benjamin Cummings U.S.A. 9th edition.
  4. Russell, P. J. (2010). i-Genetics- A Molecular Approach. Benjamin Cummings, U. S. A. 3rd edition.
  5. Griffiths, A. J. F., Wessler, S. R., Carroll, S. B., Doebley, J. (2010). Introduction to Genetic Analysis. W. H. Freeman and Co., U. S. A. 10<sup>th</sup> edition.
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# PLANT BREEDING

**Paper-XII**

**Elective Paper**

**Credits: Theory- 4, Practical-2**

**Lectures:35**

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**Unit 1: Plant Breeding:**

**(5 Lecture)**

: Introduction.

: Aim and objectives.

: Scope of plant breeding.

**Unit 2: Methods of Crop Improvement**

**(17 Lecture)**

: Introduction.

: Methods of crop improvement.

: Centres of origin and domestication of crop plants.

2.4: Plant genetic resources.

: Introduction and acclimatization.

: Selection methods: Pure line, Mass and Clonal selection.

2.7: Hybridization: Procedure.

2.8: Hybridization in self-pollinated crop plants.

2.9: Hybridization in cross pollinated crop plants.

**Unit 3: Mutation and Plant Breeding**

**(8 Lecture)**

3.1: Role of mutation

3.2: Role of

polyploidy .

3.3: Role of biotechnology in crop improvement.

**Unit 4: Intellectual Property Rights**

**(3 Lecture)**

4.1: Introduction

4.2: Types of Property.

: Intellectual Property.

: Forms of Intellectual Property.

: Advantages and Disadvantages of IPR.

## **Unit 5: Crop Breeding Institutes/Centers**

**(2 Lectures)**

: Introduction.

: International Institutes.

: National Institutes.

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### **Suggested Readings-**

1. Singh, B. D. (2005). Plant Breeding: Principles and Methods. Kalyani Publishers. 7th edition.
  2. Chaudhari, H. K. (1984). Elementary Principles of Plant Breeding. Oxford-IBH. 2nd edition.
  3. Acquaah, G. (2007). Principles of Plant Genetics & Breeding. Blackwell Publishing.
  4. Kader, A.A. (2002). Post-Harvest Technology of Horticultural Crops. UCANR Publications, U. S. A.5.
  5. Capon, B. (2010). Botany for Gardeners. 3rd Edition. Timber Press, Portland, Oregon.
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# ECONOMIC BOTANY

**Paper-XII**

**Elective Paper**

**Credits: Theory- 4 Practical-2**

**Lectures:35**

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**Unit1: Legumes**

**(7Lecture)**

1.1 Botanical names, Morphology, Source and Economic importance of Pulses-Chickpea and Red gram, legumes - Lucerne and *Sesbania*

**Unit2:PlantFibres**

**(7Lecture)**

2.1 Botanical names, Morphology, Source and Economic importance of Cotton and Coir.

**Unit3: VegetableOilSources**

**(7Lecture)**

3.1 Botanical name, source and economic importance of – Groundnut, Soybean; Brief account of cultural practices of Ground nut and Soybean.

**Unit4: DrugYieldingPlants**

**(7Lecture)**

4.1 A brief account of plant drugs and their chief constituents used in Indigenous and allopathic systems in-

- |   |                                      |
|---|--------------------------------------|
| A) Rhizome – <i>Zingiberofficinale</i>    | B) Root – <i>Withaniasomnifera</i>   |
| C) Stem – <i>Tinosporacordifolia</i>      | D) Leaf – <i>Adhatodazeylanica</i> . |
| E) Floral bud – <i>Syzigiumaromaticum</i> | F) Fruit – <i>Emblicoefficialis</i>  |

**Unit5:NaturalProducts**

**(7Lecture)**

A- Rubber- Introduction, properties of rubber, source (*Hevea brasiliensis*), morphological characters, extraction method and economic importance

B- Botanical pesticides: Botanical name, morphological characters, source and importance of Neem, Tobacco, Custard apple.

C- Plant Dyes - Botanical name, source and economic importance.

- |   |                          |
|---|--------------------------|
| a) Wood-Logwood,Kutch.                  | b) Bark-Oak,Teak.        |
| c) Root and rhizome-Manjista, Turmeric, | d) Leaves- Indigo,Henna. |
| e) Flowers-Saffron, Palas.              |                          |
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### **Suggested Readings-**

1. R.C. Grewal – Medicinal plants, Campus Books International 4825/24, Prahiadstreet, Ansari Road, Darya Ganj, NewDelhi.
  2. F.O. Bower – Plants and Man Ariana Publishing House, NewDelhi.
  3. Fuller, K.W. and Galon, J.r. 5985. Plant Products and New Technology. CalrendonPress, Oxford, NewYork.
  4. Kocchar, S.L. 5998. Economic Botany in Tropics, 2nd edition. MacmillanIndia Ltd.,NewDelhi.
  5. Sambamurthy, A.V.S.S. and Subramanyam, N.S. 5989. A Textbook ofEconomic Botany, Wiley Eastern Ltd., NewDelhi.
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## Semester- VI

### PLANT PATHOLOGY

#### Paper- XIII

Credits: Theory- 4, Practical-2

Lectures:35

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#### Unit1: Introduction

(3Lectures)

1.1: Terms, Nature, and concept of plant diseases.

1.2: Cause of disease.

: Classification of Plant Diseases Based on- 1. Symptoms, 2. Spread and Severity of Infection.

: Importance of plant diseases.

#### Unit 2: Rots, Damping offs, Downy mildews, Powdery Mildews, White rusts and Smuts

(9 Lectures)

2.1 Study of following plant diseases with respect to causal organisms, symptoms, and control measures-

1. Fruit rot of Cucurbits.

2. Late blight of Potato.

3. Downy mildew of Grapes.

4. Powdery mildew of Mango

5. White rust of Crucifers.

6. Smut of Jowar

#### Unit 3: Rusts, Wilts, Leaf spots & blights and Anthracnoses

(9 Lectures)

Study of following plant diseases with respect to causal organisms, symptoms, and control measures-

1. Brown rust of Wheat

2. Wilt of Pigeon pea (*Cajanuscajan*)

3. Brown spot of Maize

4. Tikka disease of Groundnuts

5. Red-rot of Sugarcane

#### Unit 4: Mycoplasmas, Bacteria and Viruses

(9 Lectures)

4.1 Study of following plant diseases with respect to causal organisms, symptoms, and control measures-

1. Little leaf of Brinjal

2. Oily spot of Pomegranate (Telya diseases)

3. Citrus canker

4. Tobacco & Tomato mosaic

## **Unit 5: Aerobiology and Seed Pathology**

**(5 Lectures)**

5.1: Aerobiology- Definition, scope and importance and disease forecasting.

5.2: Seed pathology- Definition, seed borne pathogens (external and internal) seed treatment (hot water, solar, chemical) and seed certification.

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### **Suggested Readings-**

1. Introductory Mycology John Wiley and Sons Inc. by Alexopoulos C.J., Mims C.W. and Blackwell. M. (1996).
  2. Introduction to Bacteria McGraw Hill book Co. New York by Clifton.A.(1958)
  3. Introductory Phycology Affiliated East – West Press Ltd. New Delhi by Kumar H. D.(1988).
  4. Introduction to Plant Viruses Chand and Co. Ltd. Delhi by Mandahar C. L.(1978).
  5. Diseases of crop plants in India Prentice Hall of India Pvt. Ltd. New Delhi by Rangaswamy G. and Mahadevan A.
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# PLANT BIOTECHNOLOGY

## Paper- XIV

Credits: Theory- 4, Practical-2

Lectures:35

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### Unit1: Recombinant DNA Technology (8 Lectures)

: Introduction and principles.

: Enzymes involved in recombinant DNA Technology.

1.3: Vectors.

1.4: Southern and northern blotting technique.

1.5: DNA finger printing.

: PCR.

: DNA libraries.

### Unit 2: Methods of Gene Transfer (8 Lectures)

: Introduction.

: Marker and Reporter genes.

: Methods of gene delivery-Physical, Chemical and Biological  
(*Agrobacterium* mediated gene transfer).

: Transgenic plants (Flavr-Savr tomato, Goldenrice).

### Unit 3: Gene Cloning (4 Lectures)

: Introduction.

: Bacterial Transformation and selection of recombinant clones

: PCR- mediated gene cloning.

: Complementation, colony hybridization.

### Unit 4: Plant Tissue Culture (10 Lectures)

: Introduction.

: Terminology in tissue culture.

4.3: Techniques of tissue culture.

: Micropropagation.

: Anther culture.

4.4: Protoplast isolation and culture.

4.5: Somatic Hybridization.

**Unit 5: Applications of Biotechnology**

**(5lectures)**

:Introduction.

: Role of Biotechnology in agriculture, Industry, Forestry.

: Biotechnological Institutes and their role (anytwo).

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**Suggested Reading-**

1. Bhojwani, S. S. and Razdan, M. K., (1996). Plant Tissue Culture: Theory and Practice. Elsevier Science Amsterdam. The Netherlands.
  2. Glick, B. R., Pasternak, J. J. (2003). Molecular Biotechnology- Principles and Applications of recombinant DNA. ASM Press, Washington.
  3. Bhojwani, S.S. and Bhatnagar, S.P. (2011). The Embryology of Angiosperms. Vikas Publication House Pvt. Ltd., New Delhi. 5th edition.
  4. Snustad, D. P. and Simmons, M. J. (2010). Principles of Genetics. John Wiley and Sons, U. K. 5th edition.
  5. Stewart, C. N. Jr. (2008). Plant Biotechnology & Genetics: Principles, Techniques and Applications. John Wiley & Sons Inc. U. S.A.
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# CELL BIOLOGY

**Paper- XV**

**Credits: Theory- 4, Practical-2**

**Lectures:35**

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## **Unit 1: Microscopic Techniques in Biology**

**(8 Lectures)**

1.1: Principles of microscopy.

1.2: Light microscopy.

1.3: Sample preparation for light microscopy.

1.4: Phase contrast microscopy.

: Electron microscopy (EM)- Scanning electron microscopy (SEM) and Scanning transmission electron microscopy (STEM).

: Sample Preparation for electron microscopy.

## **Unit 2: Cell- Unit of Life**

**(5 Lectures)**

: The Cell Theory.

: Prokaryotic cell- structure, cell size and shape.

2.3: Eukaryotic cells- structure, cell size and shape.

2.4: Eukaryotic cell components.

## **Unit 3: Cell Organelles**

**(10 Lectures)**

: Ultra structure and function- Mitochondria, Chloroplast, Nucleus, ER, Golgi body, Lysosomes, Peroxisomes and Glyoxisomes, Cell-Membrane and Cell wall.

: Structure and function of cytoskeleton & its role in motility.

## **Unit 4: Chromosome**

**(6 Lectures)**

: Introduction.

: History of chromosome.

4.3: Morphology, shape, size.

4.4: Types of Chromosome.

4.5: Karyotype.

**Unit 5: Cell Division****(6 Lectures)**

5.1: Mitosis & Meiosis, their regulations.

5.2: Steps in cell cycle.

: Regulation & Control of cell cycle.

: Significance of cell cycle (Mitosis and Meiosis).

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**Suggested Reading-**

1. Lewin B. 2000 Genes VII Oxford University Press, New York.
  2. Wolfe, S. L. (1993) Molecular and cell Biology-Wadsworth publishing Co. California, U.S.A.
  3. Krishnmourthy, K. V. (2000) Methods in Cell Wall chemistry. CRC Press, Boca Raton, Florida.
  4. Buchanan, B. B. Griess W and Jones, R.L. 2000. Biochemistry and Molecular Biology of Plants American Society of plant Physiologists, Maryland, U.S.A.
  5. Harris, N. and Oparika, K.J. 1994. Plant cell Biology: A Practical Approach, IRL press at Oxford university Press, Oxford, U.K.
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# NURSERY, GARDENING & HORTICULTURE

**Paper-XVI**

**Elective Paper**

**Credits: Theory- 4, Practical-2**

**Lectures:35**

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## **Unit1: Nursery & Gardening**

**(6 Lectures)**

:Introduction.

: Objectives and scope.

: Types of gardening–landscape, home gardening and parks

1.4: Computer applications in landscaping.

## **Unit 2: The Seed**

**(10 Lectures)**

:Introduction.

: Structure and types.

: Seed dormancy; causes and methods of breaking dormancy.

: Seed storage: Seed banks, factors affecting seed viability, genetic erosion.

2.5: Seed production technology.

2.6: Seed testing and certification.

## **Unit 3: Vegetative Propagation**

**(6 Lectures)**

:Introduction.

: Types of layering, cutting, budding and grafting.

## **Unit 4: Horticultural Techniques**

**(5 Lectures)**

:Introduction.

: Application of manure, fertilizers, nutrients and PGRs.

4.3: Weed control, Biofertilizers and biopesticides.

## **Unit5: Floriculture**

**(8 Lectures)**

:Introduction.

: Cutflowers.

: Bonsai, commerce (market demand and supply).

5.4: Importance of flower shows and exhibitions.

**Suggested Reading-**

1. Singh, D. & Manivannan, S. (2009). Genetic Resources of Horticultural Crops. Ridhi International, Delhi, India.
  2. Swaminathan, M. S. and Kochhar, S. L. (2007). Groves of Beauty and Plenty: An Atlas of Major Flowering Trees in India. Macmillan Publishers, India.
  3. NIIR Board (2005). Cultivation of Fruits, Vegetables and Floriculture. National Institute of Industrial Research Board, Delhi.
  4. Kader, A. A. (2002). Post-Harvest Technology of Horticultural Crops. UCANR Publications, U. S.A.
  5. Capon, B. (2010). Botany for Gardeners. 3rd Edition. Timber Press, Portland, Oregon.
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# BIOSTATISTICS

**Paper-XVI**

**Elective Paper**

**Credits: Theory- 4, Practical-2**

**Lectures:35**

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## **Unit1:Introduction**

**(7Lectures)**

:Definition.

: Basicprinciples.

: Statisticalmethods.

: Variables - measurements, functions, limitations and uses ofstatistics.

## **Unit 2: Collection of Primary andSecondary Data**

**(7Lectures)**

2.1: Introduction

2.2: Types of data

2.3: Methods of data collection.

2.4: Merits and demerits.

: Classification ofdata.

: Tabulation and presentation of data

2.7: Samplingmethods

## **Unit3: Measures ofCentralTendency**

**(7Lectures)**

:Introduction.

: Mean, median and mode, merits &demerits.

: Measures of dispersion- range, standard deviation and meandeviation, merits &demerits.

: Co- efficient ofvariations.

## **Unit4: Probability**

**(7Lectures)**

:Introduction.

: BasicConcepts.

: Kinds of Probabilities.

4.4: Measures ofProbability.

## **Unit 5:StatisticalInference**

**(7Lectures)**

:Introduction.

: Hypothesis - Student 't' test and chi square test and its significance.

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**Suggested Readings-**

1. Biostatistics Dannel, W.W., 1987. New York, John Wiley Sons.
  2. An introduction to Biostatistics, 3rd edition, Sundarrao, P. S. S and Richards, J. Christian Medical College, Vellore.
  3. Statistical Analysis of epidemiological data, Selvin, S., 1991. New York University Press.
  4. Statistics for Biology, Boston, Bishop, O. N. Houghton, Mifflin.
  5. Statistics for Biologists, Campbell, R. C., 1998. Cambridge University Press.
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# PLANT SYSTEMATICS & PLANT PATHOLOGY

## Practical- IV

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1. Preparation of botanical description of a plantspecies.
2. Study of rootypes.
3. Study of stemmodifications.
4. Study of inflorescence types (Cymose, Racemose &Specialized).
5. Study of fruit types.
- 6-11. Study of families as per theory syllabus (Available plant families and Bentham and Hooker's system to be followed).
  1. Annonaceae
  2. Malvaceae
  3. Rutaceae
  4. Rubiaceae
  5. Bignoniaceae
  6. Lamiaceae
  7. Nyctaginaceae
  8. Polygoniaceae
  9. Orchidaceae
  10. Poaceae.
12. Identification of genus and species with the help of regional (any available)flora.
13. Preparation & submission of herbarium specimens preferably of weeds(10).
14. Study of laboratory equipment's- Autoclave, Hot Air Oven, Inoculatingchamber, Laminar Air Flow, Air Sampler, Incubator, Centrifugeetc.
15. Preparation of culture media(PDA).
16. Micrometry- Calibration of microscope and measurement of fungalspores.
17. Study of air-borne pathogen by exposed petri plates/airsampler.
18. Isolation of plant pathogens (Serial Dilution Agar PlateMethod).
19. Estimation of chlorophylls (Any healthy & diseased/infected plantmaterial).
20. Study of symptoms and causal organismsof-
  1. Rots- Fruit rot ofCucurbits
  2. Damping offs- Late blight ofPotato
  3. Downy mildews- Downy mildew ofGrapes.
21. Study of symptoms and causal organismsof-
  1. White rusts- White rust ofCrucifers.
  2. Powdery Mildews- Powdery mildew ofMango
  3. Smuts- Smut ofJowar
22. Study of symptoms and causal organismsof-
  1. Rusts- Brown rust ofWheat

2. Wilts- Wilt of Pigeon pea (*Cajanuscajan*)
  3. Leaf spots- Brown spot ofMaize
23. Study of symptoms and causal organismsof-
1. Leaf blights- Tikka disease of Groundnuts
  2. Anthracnoses- Red-rot of Sugarcane
  3. Mycoplasmas- Little leaf of Brinjal
24. Study of symptoms and causal organismsof-
1. Bacteria- Citrus canker, Oily spot of Pomegranate (Telyadiseases)
  2. Viruses- Tobacco & Tomatomosaic
25. Study Excursion Report & Collection and submission of plant diseases as per the theory syllabus.
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# GENETICS & PLANT BIOTECHNOLOGY

## Practical- V

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1. Solve the problems based on Mendelian inheritance (Monohybrid ratio and Dihybridratio)
  2. Studies on Mendelian trait by using pea plant.
  3. Studies on genetic trait related to the Colour blindness, Haemophilia, Holandric genes by using photograph.
  4. Solve the problems based on Linkage and crossing over (two point cross, three pointcross)
  5. Solve the problems based on polygenic inheritance
  6. Solve the problems based on Population genetics.
  7. Study of *Mirabilis jalapa* with respect to Plastid inheritance
  8. Studies on biotechnological equipments (Principle and working).
  9. Study of recombinant vectors with the help of photographs.
  10. Studies on transgenic plant (Bt-cotton and golden rice)
  11. Demonstration of Gene transfer techniques (Video/Photograph).
  12. Demonstration of gel-electrophoresis techniques
  13. Organization of plant tissue culture laboratory.
  - 14-16. Aseptic culture techniques for establishment and maintenance of cultures  
Techniques in Plant Tissue Culture.
  17. Demonstration of Southern blotting technique with the help of Chart/photograph
  18. Demonstration of Northern blotting technique with the help of Chart/photograph
  - 19-20. Preparation of plant tissue culture medium (M.S.)
  - 21-23. Study of anther, embryo culture and micropropagation.
  24. Isolation of protoplast from given plant material
  25. Visit to Biotechnology laboratory
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# MOLECULAR BIOLOGY & CELL BIOLOGY

## Practical- VI

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1. Preparation of LB medium and raising *E.Coli*.
  2. Isolation of genomic DNA from *E.Coli*.
  3. DNA isolation from cauliflower head (or any suitable plant material).
  4. Qualitative and Quantitative estimation of DNA by diphenylamine reagent.
  5. Qualitative and Quantitative estimation of RNA by Orcinol reagent.
  6. Dialysis of starch and simple sugar.
  - 7-8. Study of DNA replication mechanisms through photographs (Rolling circle, Theta replication and Semi-discontinuous replication).
  9. Study of structures of prokaryotic RNA polymerase and eukaryotic RNA polymerase-II through photographs.
  10. Photographs establishing nucleic acid as genetic material (Griffith's experiments).
  11. Mitosis and the cell cycle in onion root-tip cells.
  12. Meiotic cell division in *Allium* spp.
  13. Study of permeability of plasma membrane.
  14. Isolation of Mitochondria
  15. Isolation of chloroplasts.
  16. To study of karyotype and prepare ideogram of plant by photograph.
  17. Estimation of amount of chlorophyll present in the leaf tissue.
  18. Observation of growth and differentiation in single cells.
  19. Structure of onion peel cell.
  - 20-24. Microtome technique.
  25. Submission (submit at least 5 slides per student- Microtome technique).
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# PLANT BREEDING & NURSERY GARDENING AND HORTICULTURAL PRACTICES

## Practical- VII (Elective)

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1. To study floral biology in self-pollinated cropplants.
2. To study floral biology in cross pollinated cropplants.
3. To study pollenviability.
4. Calibration of ocular micrometer and estimate the size of pollengrain.
5. To study hybridization techniques in Malvaceae.
6. To study hybridization techniques in Fabaceae.
7. To study hybridization techniques in Brassicaceae.
8. To study hybridization techniques inPoaceae.
9. Study of male sterility in sorghum in field or in laboratory by staining the pollen grain.
10. Studies on Learning the precautions on handling of different mutagenicagents: Physical and chemicalmutagens.
11. Different types of pots and potting medium & Potting andRepotting.
- 12-13. Propagation practices by seed, vegetative propagation, cutting, budding, layering and grafting.
14. Method of preparing Bonsai, Bottle garden/Terrarium, Hanging Baskets,Dish Garden.
15. Preparation of gardenlayout.
16. List of plants suitable for garden locations- 2 to 3 plants for eachlocation.
- 17-18. Identification of important horticultural plants- herbs(Foliage and flowering); shrubs(Foliage and flowering); trees (Foliage and flowering); climbers; Lianas; Epiphytes; Creepers; Trailers; Aquatic plants; Succulents;(from all types- any two plants).
- 19-20. Flower Arrangements- Indian (Gajara, Veni, Garland, Bouquet, Pot, Hanging).
- 21-22. Green house plants- Information regarding soil, temperature, irrigation and fertilizer, requirements and propagation methods for- Anthurium, Gerbera, Orchids, Tuberose, Carnation, Roses and Capsicum.

23-24. **Project-** Each student should individually present a project to any topic related to nursery and garden development. It should be duly certified by HOD and submit in the practical examination (Compulsory).

**25. Visits:**

1. Visit to breeding/researchstations.
  2. Visit to garden/Parks/Nurseries/Exhibition/Horticulture industries etc. and record should be duly certified by HOD and submit in practical examination.
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# ECONOMIC BOTANY & BIOSTATISTICS

## Practical- VII (Elective)

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1. Study of Vegetative, Floral morphology and pod in Chickpea, Redgram.
  2. Study of fodder legumes: Source and uses: Sesbania and Lucerne.
  3. Study of structure of oil storing tissues in sectioned seeds of Groundnut and Coconut endosperm using micro chemical tests.
  4. Study of vegetative, Floral and Fruit morphology of Cotton. Microscopic structure of Cotton fibres.
  5. Study of plants (live or herbarium) used as source of drugs as per theory.
  6. Study of plant pesticides (as per theory).
  7. Study of dyes- source and uses (as per theory).
  8. Study of ornamental plants, seasons of flowering plants, botanical name, morphology and uses (as per theory).
  9. Study of plant perfumes and cosmetics (as per theory).
  10. Horticultural term Paper- Based on- Seasonal/Perennials/Climbers/Cacti/Succulents/Bonsai/Indoor plants and Cut flowers etc.
  - 11-13. Methods of estimation of Heterosis (i) Mid- Parent Heterosis (ii) Better parent Heterosis (iii) Standard Heterosis (Demo).
  14. Determination of interspecific variation in chromosome number in Allium.
  - 15-16. Collection of Data and tabulation.
  - 17-18. Methods of sampling.
  - 19-20. Presentation of Data.
  21. Measures of central tendency (Mean, mode and median) of given plant material.
  22. Calculation of Standard Deviation.
  23. Examples based on probability.
  24. Calculation of 't' test.
  25. Calculation of chi square test.
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