

**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. II (Sem.–III& IV)

(Syllabus to be implemented from w.e.f. June 2020)

Draft Structure for B. Sc-II

Core Subject : Botany

PUNYASHLOK AHILYADEVI HOLKAR

Solapur University, Solapur

Faculty of Science & Technology

Choice Based Credit System (CBCS) (w.e.f.2020-21)

Subject/ Core Course	Name and Type of the Paper		No. of papers/ Practical	Hrs/week			Total Marks Per Paper	UA	CA	Credits
	Type	Name		L	T	P				
Class :	B.Sc.- II Semester – III									
Core	(*Students can opt any Three subjects among the Four	DSC 1C	Paper-V	3.0	--	--	50	40	10	4.0
(*Students can opt any Three			Paper-VI	3.0	--	--	50	40	10	
subjects among the Four		DSC 2C	Paper-V	3.0	--	--	50	40	10	4.0
Subjects offered at B.Sc.I. Out	Paper-VI		3.0	--	--	50	40	10		
of Three Subjects offered One	DSC 3C		Paper-V	3.0	--	--	50	40	10	4.0
Subject will be the Core Subject OR		Paper-VI	3.0	--	--	50	40	10		
		AECC - Environmental Studies		3.0	--	--	-	-	-	NC
	SEC-1		2.5			50	40	10	2.0	
Grand Total				23.5	--	--	350	280	70	14
Class :	B.Sc.- II Semester – IV									
Core (*Students can opt any Three subjects among the Four Subjects offered at B.Sc.I. Out of Three Subjects offered One Subject will be the Core Subject OR Students can opt any Two subjects among the Four Subjects offered at B.Sc.I. Out of Two Subjects One Subject will be the Core Subject and any One Subject among the other willbe	DSC 1D	Paper-VII	3.0	--	--	50	40	10	4.0	
		Paper-VIII	3.0	--	--	50	40	10		
	DSC 2D	Paper-VII	3.0	--	--	50	40	10	4.0	
		Paper-VIII	3.0	--	--	50	40	10		
	DSC 3D	Paper-VII	3.0	--	--	50	40	10	4.0	
		Paper-VIII	3.0	--	--	50	40	10		

Elective Subject										
		SEC-2		2.5			50	40	10	2.0
Total (Theory)				20.5	--	--	350	280	70	14
DSE (Practical)		DSC 1C & 1D	Pr. III&IV	--	--	8	100	80	20	4.0
		DSC 2C & 2D	Pr. III&IV	--	--	8	100	80	20	4.0
		DSC 3C & 3D	Pr. III&IV	--	--	8	100	80	20	4.0
Total (Practical)						24	300	240	60	12
Grand Total				43.5		24	1000	800	200	40

Abbreviations:

L: Lectures

T: Tutorials

P: Practicals

UA: University Assessment

CA: College Assessment

DSC / CC: Core Course

AEC: Ability Enhancement Course

DSE: Discipline Specific Elective Paper

SEC: Skill Enhancement Course

GE: Generic Elective

CA: Continuous Assessment

ESE: End Semester Examination

B.Sc.II SYLLABUS WITH EFFECT FROM JUNE 2020

SEMESTER- III

Paper V Plant Anatomy

35 Lectures

Unit 1: Meristematic tissue (8 Lectures)

- 1.1 Introduction, Characteristics and Classification of meristems based on position
- 1.2 Classification of meristem based on origin, position and plane of division.
- 1.3 Theories of structural development
 - a) Apical cell theory
 - b) Histogen theory
 - c) Tunica Corpus theory.

Unit 2. Permanent tissue: (08 Lectures)

- 2.1 Simple and complex tissue
- 2.2 structure and function of simple tissues
 - a) Parenchyma . b) Collenchyma c) Sclerenchyma
- 2.3 structure and function of Complex tissue
 - a) Xylem b) Phloem
- 2.4 Types of Vascular bundles

Unit 3. Primary structure of plant body. (06 Lectures)

- 3.1 Primary structure of Monocotyledon and Dicotyledon root.
- 3.2 Primary structure of Monocotyledon and Dicotyledon stem.

Unit 04 . . Secondary structure of plant body. (08 Lectures)

- 4.1. Normal secondary growth in Dicotyledon root and stem
- 4.2. Anomalous / secondary growth in Bignonia (Dicot.) and Dracaena stem.
- 4.1 Vascular cambium – structure and function
- 4.4 Periderm and Lenticel, Tylosis, Wood types.

Unit 5: Tissue system . (05 Lectures)

- 5.1 : Epidermal tissue system
- 5.2: Secretory tissue system
- 5.3: Mechanical tissue system

Paper VI

Plant metabolism

35 Lectures

Unit 1: Enzymes

(8 Lectures)

- 1.1 Introduction.
- 1.2 Classification of enzymes.
- 1.3 mechanism of enzyme action.
- 1.4 Properties of enzymes.

Unit 2: Nitrogen metabolism

(5 Lectures)

- 2.1 Introduction,
- 2.2 Nitrogen cycle
- 2.3 Biological nitrogen fixation – Definition, types and organisms involved,
- 2.4 Mechanism of biological nitrogen fixation.
- 2.5 Significance of biological nitrogen fixation

Unit 3: Plant growth regulators

(8 Lectures)

- 3.1 Introduction
- 3.2 Discovery
- 3.3 Types of growth regulators
 - a. PGR - auxins, gibberellins, cytokinins (Physiological role of growth regulators)
 - b. Growth inhibitors – ABA, Ethylene (Physiological role of growth regulators)

Unit 4: Mineral nutrition

(6 Lectures)

- 4.1 Introduction,
- 4.2 Macronutrients, Role of macronutrients (N, P, K), Role of Micronutrients (Fe, Mn.)

Unit 5: Carbohydrate metabolism

(8 Lectures)

- 5.1 Introduction and
- 5.2 Broad classification;
- 5.3 Monosaccharides - Properties and examples (Triose , Tetrose, Pentose and Hexose)
- 5.4 oligosaccharides - Properties and examples (Sucrose , Maltose and Lactose)
- 5.5 Polysaccharides - Properties and examples (Starch and Cellulose)

SEMESTER IV

Paper VII

Plant Physiology

35 Lectures

Unit 1: Plant response to light and temperature

(8 Lectures)

- 1.1 Photoperiodism – Definition, Classification (SDP, LDP, Day neutral plants);
- 1.2 Phytochrome Definition, Role of phytochrome (red and far red light responses on
- 1.3 photo morphogenesis);
- 1.4 Vernalization: Definition, Mechanism, Significance.

Unit 2: Translocation in phloem

(6 Lectures)

- 2.1 Definition of Symplastic transport and apoplastic transport,
- 2.2 Phloem loading and unloading.
- 2.3 Mechanism of translocation in phloem – Mass flow hypothesis
- 2.4 Source and sink relationship : During vegetative and reproductive phase.

Unit 3: Photosynthesis

(8 Lectures)

- 3.1 Introduction.
- 3.2 Photosynthetic Apparatus
- 3.3 Photosynthetic Pigments (Chl a, b, xanthophylls, carotene);
- 3.4 Light reaction – Cyclic and non cyclic
- 3.5 Dark reaction – C₃, C₄, CAM Pathway

Unit 4: Respiration

(5 Lectures)

- 4.1 Introduction
- 4.2 Structure of Mitochondrion
- 4.3 Types – Aerobic - Glycolysis, Linkage stage and TCA Cycle
- 4.4 ETS

Unit 5: photorespiration

(8 Lectures)

- 5.1 Introduction:
- 5.2 Site of photorespiration
- 5.3 Mechanism of photorespiration
- 5.4 Significance

Paper VIII

EMBRYOLOGY OF ANGIOSPERMS

35 Lectures

Unit 1: Structural organization of flower

(9 Lectures)

- 1.1. Concept of flower as a modified Shoot.
- 1.2 structure of typical flower.
- 1.3 Structure of typical Androecium, Structure of tetrasporangiate anther and pollen grain.
- 1.4: Structure of typical Gynoecium: Structure of a typical ovule, Types of ovules.

Unit 2.: Pollination and fertilization

(9 Lectures)

- 2.1 Definition, self and cross Pollination
- 2. 2 Mechanism in Anemophily (*Zea mays*), Entomophily (*Calotropis*) and Hydrophily (*Vallisneria*)
- 2.3: Microsporogenesis, and development of male gametophyte
- 2.4: Megasporogenesis and development of female gametophyte: Monosporic (*Polygonum*) and Bisporic (*Allium*)
- 2.4 **Fertilization**: Entry of pollen tube, double fertilization and triple fusion. Significance of double fertilization.

Unit 3: Embryo and Endosperm Development.

(9 Lectures)

- 3.1 Structure and development of embryo in Monocotyledons.
- 3.2 Structure and development of embryo in Dicotyledons.
- 3.3 Development of endosperm,.
- 3.4 Types of endosperm- Nuclear, Helobial and Cellular.

Unit 4. : Seed and fruit dispersal

(8 Lectures)

Agents and mechanism of seed and fruit dispersal.

Practical- I

- 1) Study of shoot and root apex by permanent slides.
- 2) Study of simple tissues.
- 3) Study of complex tissues.
- 4) Study of primary structure of dicot and monocot root
- 5) Study of primary structure of dicot and monocot stem
- 6) Study of anomalous secondary growth in *Bignonia*.
- 7) Study of anomalous secondary growth in *Dracaena*.
- 8) Study of double stained micro preparation in *Bignonia and Dracaena* stem.
- 9) Study of double stained preparation of anomalous secondary growth in *Dracaena*.
- 10) Study of anatomy of porous (ring porous & diffused porous) and non porous wood.
- 11) Maceration technique.
- 12) Study of Epidermal tissue system.
- 13) Study of Secretory Tissue system.
- 14) Study of Mechanical tissue system.
- 15) Study of role and deficiency symptoms of N, P, K,
- 16) Study of role and deficiency symptoms of Fe, Mn.
- 17) Estimation of Chlorophylls by Colourometric / Spectrophotometric method.
- 18) Separation of photosynthetic pigments by ascending paper chromatography.
- 19) Study of Kranz leaf anatomy in C4 plants.
- 20) Estimation of TAN value in CAM plants.
- 21) Study of evolution of oxygen during photosynthesis.
- 22) Study of effect of light intensity on photosynthesis.
- 23) Detection of Phosphate, Potassium and Iron in the plant tissue by biochemical tests.
- 24) Determination of sugar percentage by hand refractometer.
- 25) Botanical Excursion Report.

Practical- II

- 1) Study of typical flower and its parts (floral whorls with their functions).
- 2) Study of young / mature anther by permanent slide.
- 3) Study of germination of pollen grains.
- 4) Detection of pollen fertility by staining technique.
- 5) Study of types of ovules (by permanent slide or photograph).
- 6) Study of dicotyledon and monocotyledon embryo (by permanent slide or photograph).
- 7) Dissection of embryo
- 8) Study of endosperm from developing seeds (*Grevillia* / *Cucumis*).
- 9) Dispersal of seeds.
- 10) Dispersal of Fruits.
- 11) Study of self pollinated plants
- 12) Study of cross pollinated plants
- 13) Study of pollination mechanism (Maize, *Calotropis*)
- 14) Determination of rate of respiration during seed germination by Ganong's respirometer.
- 15) Effect of different concentrations of Auxins (IAA) on seed germination (any suitable dicot seeds).
- 16) Effect of different concentrations of Gibberellic acid (GA) on seed germination (any suitable monocot seeds).
- 17) Effect of different concentrations of Ethylene on fruit ripening
- 18) Breaking of seed dormancy by mechanical and chemical scarification.
- 19) Study of effect of pH on Catalase enzyme activity.
- 20) Study of effect of temperature on Malate dehydrogenase enzyme activity.
- 21) Janus green B staining technique for mitochondria.
- 22) Demonstration of fermentation.
- 23) Study of biofertilizers.
- 24) Separation of Amino acids by Thin Layer chromatography.
- 25) Horticulture Term Paper / Field Visit Report / Project Report

Plant Physiology and Metabolism

1. Hopkins, W. G. 1995. Introduction to Plant Physiology. John Wiley & Sons, Inc., New York, USA.
2. Moore, T. C. 1989. Biochemistry and Physiology of Plant Hormones. (2nd edition). Springer – Verlag, New York, USA.
3. Salisbury, F.B. and Ross, C. W. 1992. Plant Physiology. (4th edition). Wadsworth Publishing Co., California, USA. 19
4. Taiz, L. and Zeiger, E. 1998. Plant Physiology. (2nd edition) Sinauer Associates, Inc., Publishers, Massachusetts, USA.
5. R.C. Grewal – Plant Physiology. Campus Books International 483/24, Prahiad street Ansari Road, Darya ganj, New Delhi – 110002.
6. V.K. Jain – Fundamentals of Plant Physiology. S. Chand & Company Ltd. Ramnagar, New Delhi – 110055.
7. Salisbury Ross – Plant Physiology. CBS, Publishers & Distributions 485/ Jain Bhawan, Bhole Nath Nagar, Shahdara, New Delhi – 110032.
8. Devlin & Witham – Plant Physiology. CBS Publishers & Distributors 485, Jain Bhavan, Bhole Nath Nagar, Shahdara, New Delhi – 110032.
9. G. Ray Noggle / G. Fritz- Introductory Plant Physiology. Prentice Hall of India Ltd. New Delhi – 110001.
10. V.Verma. Text Book of Plant Physiology. Emkay Publications., B-19, East KrishnaNagar, Delhi-1100051.
11. V.I. Paladin. Plant Physiology. Arihant Publishers. Jaypur, (India)
12. Dr. S. Sundara rajan- Physiology of Transport in Plants. Anmol Publications, Pvt. LTD. New Delhi.110002.
13. D.O.hall & K.K. Rao. Photosyntheis. Edward Arnold, East Street, Baltimore, Mary-land- 21202,U.S.A.
14. Bidwell, R.G.S. 1974. Plant Physiology. Macmillan P ub. Co., N.Y.
- 15.Devlin, R.M. and F.H. Witham. 1983. Plant Physiology. Willard Grant Press. U.S.A.
- 16.Hans-Walter Heldt. 1997. Plant Biochemistry and Molecular Biology. Oxford University Press, New York. Usa.
17. Jain, V.K. (2000): Fundamentals Of Plant Physiology ,S.Chand&Co, New Delhi.
18. Pandey, S.N. (1991): Plant Physiology, Vikas Publishing House (P) Ltd., New Delhi, India.
19. Verma, V. (2007): Text Book of Plant Physiology. Ane Books India, New Delhi.
20. Nobel, P.S. 2009. Physicochemical and Environmental Plant Physiology.4th edition Academic Press, UK
21. Taiz, L. and Zeiger, E. 2006. Plant Physiology. 4th Edition. Sinnauers Associates, Saunders land, Massachusetts, USA
22. Helgi OPik, Stephen A. Rolfe, Arthur J. Willis. 2005. The Physiology of Flowering Plants, Cambridge University Press, UK
23. Kirkham, M.B. 2004. Principles of Soil and Plant Water Relations. Elsevier, Amsterdam, Netherlands.
24. Dennis, D.T., Turpin, D.H., Lefebvre, D.D. and Layzell, D.B. 1997. Plant Metabolism. 2nd Edition. Longman Group, U.K.
25. Fitter, A. and Hay, R.K.M. 2001. Environmental Physiology of Plants. Academic Press, UK.
26. Emil Tmog, Mineral Nutrition of Plants. Oxford and IBH Publishing House, Bombay/ New Delhi.
- 27.S. Sundara rajan- Plants Physiology. Anmol Publications, Pvt. LTD.New Delhi.110002.

Angiosperm Anatomy and Embryology

1. P.C. Vashista. - Plant Anatomy. Pradip Publications, Opposite Sitla mandir, Jalandhar- 144008.
2. B.P.Pandey - Plant Anatomy. S.Chand & Company,LTD. Ram Nagar, New Delhi.110055.
3. A.C.Datta. - Botany For Degree Students. Press-Delhi, Bombay, Madrass
4. Carlquist, S. 1998.- Comparative Wood Anatomy: Systematic, Ecological and Evolutionary Aspects of dicotyledonous Wood.Springer – Verlag, Berlin.
5. Culter, E.G. 1969. Part I.- Cells and Tissues. Edward Arnold, London.
6. Culter, E.G. 1971. Part II- Organs.- Plant Anatomy: Experiment and Interpretation. Edward Arnold, London.
7. Esau, K. 1977. - Anatomy of Seed Plants. 2nd edition, John Wiley and Sons, New York.
8. Fahn, A. 1974. - Plant Anatomy. 2nd edition. Pergamon Press, Oxford.
9. Lyndon, R.F. 1990. - Plant Development: The Cellular Basis. Unwin Hyman, London.
10. Mauseth, J.D. 1988.- Plant Anatomy. The Benjamin/Cummings Publishing Company Inc., Metro Park, California, USA.
11. Nair, M.N.B. 1998. - Wood Anatomy and Major Uses of Wood. Faculty of Forestry, Universiti Putra Malaysia, 43400 Serdang, Selangor D.E., Malaysia.
12. Rahvan, V. 2000.- Developmental Biology of Flowering Plants. Springer- verlag, New York.
13. Raven, P.H., Evert, R.F.and Eichhorn, S.E. 1999. - Biology ofPlants. 5th edition. W.H., Freeman and Co., Worth Publishers, New York.
14. Steeves, T.A. and Sussex, I.M. 1989. - Patterns in Plant Development. 2ndedition. Cambridge University, Press, Cambridge.
15. Thomas, P. 2000. - Trees: Their Natural History. Cambridge University Press, Cambridge.
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18. Eams and Mc Daniel. An Introduction to Plant Anatomy. McGraw –Hill Book Co. Ltd and Kogakusha Co, Tokyo, Japan
19. Adriance S Foster. Practical Plant Anatomy. D Van Nostrand Co. INC, Newyork
20. Pijush Roy. Plant Anatomy. New Central Book Agency Ltd, Kolkata
21. Pandey S N and Ajanta Chadha. Plant Anatomy and Embryology.Vikas Publishing House,Pvt, Ltd, New Delhi
22. Bhojwani S S and Bhatnagar S P. An Embryology of Angiosperms.
23. Maheshwari P. An introduction to Embryology of Angiosperms.
24. Nair P K K. Essentials of Palynology.
25. S. C. Datta. Systematic Botany. New Age International Publishers, New Delhi. (2015).

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B.Sc. II Practical Examination in Botany (CBCS)

March/April 2020

Center: Practical II

Date: Batch Total Marks: 80

N.B.-

- 1. Draw neat & labeled diagrams wherever necessary**
- 2. Do not write about points of theoretical information unless asked specifically**
- 3. Perform the experiment as per instructions given by the examiner**

Q.1. Make a double stain permeant micro preparation of a T.S. of specimen A and show it to the examiner (No written answer) 14

Q.2. Macerate the given sample B & prepare a slide from it. Show the slide to the examiner (No written answer) 7

Q.3. Set up the physiological experiment assigned to you and record your observations, submit the report to the examiner (written answer) 14

Q.4. Set up the physiological experiment assigned to you and record your observations, submit the report to the examiner (written answer) 7

Q.5. Identification 18

E- Identify & Describe

F- Identify & Describe

G-Identify the role & deficiency symptoms

H-Identify the role & Deficiency symptoms

I- Identify & describe the biochemical test

Q.6. A) Journal 10

B) Excursion Report 10

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
B.Sc. II Practical Examination IN Botany (CBCS)
Practical -III
March/April 2020

Center:

Date:

Total Marks: 80

N.B.-

- 1. Draw neat & labelled diagrams wherever necessary**
- 2. Do not write about points of theoretical information unless asked specifically**
- 3. Perform the experiment as per instructions given by the examiner**

Q.1. Determine the fertility of pollen / Perform practical for detection of pollen germination of given specimen A (Written answer) 14

Q.2. Dissect out the given material B for embryo dissection/describe the dicot or monocot embryo by using permanent slides/photographs (No written answer) 7

Q.3. Identify the mechanism of pollination of given material C (written answer) 7

Q.4. Perform the practical to detect rate of respiration/Separate the given sample D by TLC to detect amino acids. (Written answer) 7

Q.5. Detect the enzyme activity of given sample E/Detect the mitochondria in given sample E by using specific staining method. (Written answer) 7

Identification 18

F- Identify & Describe

G- Identify & Describe

H-Identify & describe mode of seed dispersal

I-Identify & describe effect of growth regulators

J- Identify& comment on

K-Identify & comment on

Q.6. A) Journal 10

B) Horticulture term paper 10