



**VIJAYANAGARA SRI KRISHNADEVARAYA UNIVERSITY**  
**Jnanasagara campus, Bellary-583105**

**Bachelor of Science in Botany**

**V and VI semester Syllabus**

**Effective from Academic Year 2023-24**  
**(Revised as per NEP-2020)**



**VIJAYANAGARA SRI KRISHNADEVARAYA UNIVERSITY**  
 Jnanasagara campus, Vinayaka nagara, Cantonment, Bellary. -583105

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**B.Sc. (Botany) Programme with effect from 2021-22**

<b>THIRDYEAR; SEMESTER-5</b>										
<b>Objective: Real time Learning &amp; Ability to solve complex problems that are ill-structured</b>										
Category	Course code	Title of the Paper	Marks			Teaching hours/week			Credit	Duration of exams (Hrs)
			IA	SEE	Total	L	T	P		
<b>DSC5</b>	<b>21BSC5C5BOTTL</b>	<b>Plant Morphology and Taxonomy</b>	40	60	100	4	-	-	4	3
	<b>21BSC5C5BOTP</b>	<b>Plant Morphology and Taxonomy</b>	25	25	50	-	-	4	2	3
<b>DSC6</b>	<b>21BSC5C6BOTL</b>	<b>Genetics and Plant Breeding</b>	40	60	100	4	-	-	4	3
	<b>21BSC5C6BOTP</b>	<b>Genetics and Plant Breeding</b>	25	25	50	-	-	4	2	3
Another Department course (Theory+Practical)	Another Department code	Another Department Course Title <b>(Theory)</b>	40	60	100	4	-	-	4	3
	Another Department code	Another Department Course Title <b>(Lab)</b>	25	25	50	-	-	4	2	3
Another Department course (Theory+Practical)	Another Department code	Another Department Course Title <b>(Theory)</b>	40	60	100	4	-	-	4	3
	Another Department code	Another Department Course Title <b>(Lab)</b>	25	25	50	-	-	4	2	3
<b>SEC4</b>	--	<b>Employability Skills/Cyber Security</b>	-	-	-	2	-	2	3	3
<b>Semester Total</b>									<b>27</b>	

## B.Sc. (Botany) Programme with effect from 2021-22

<b>THIRD YEAR; SEMESTER-6</b>										
<b>Objective: Real time Learning &amp; Ability to solve complex problems that are ill-structured</b>										
Category	Course code	Title of the Paper	Marks			Teaching hours/week			Credit	Duration of exams (Hrs)
			IA	SEE	Total	L	T	P		
<b>DSC7</b>	<b>21BSC6C7BOTL</b>	<b>Cell Biology</b>	40	60	100	4	-	-	4	3
	<b>21BSC6C7BOTP</b>	<b>Cell Biology</b>	25	25	50	-	-	4	2	3
<b>DSC8</b>	<b>21BSC6C8BOTL</b>	<b>Plant Physiology and Biochemistry</b>	40	60	100	4	-	-	4	3
	<b>21BSC6C8BOTP</b>	<b>Plant Physiology and Biochemistry</b>	25	25	50	-	-	4	2	3
Another Department course (Theory+Practical)	Another Department code	Another Department Course Title <b>(Theory)</b>	40	60	100	4	-	-	4	3
	Another Department code	Another Department Course Title <b>(Lab)</b>	25	25	50	-	-	4	2	3
Another Department course (Theory+Practical)	Another Department code	Another Department Course Title <b>(Theory)</b>	40	60	100	4	-	-	4	3
	Another Department code	Another Department Course Title <b>(Lab)</b>	25	25	50	-	-	4	2	3
<b>Internship</b>	---	<b>Internship Discipline specific</b>							2	
<b>Semester Total</b>									<b>26</b>	

## 6<sup>th</sup> Semester Syllabus for B.Sc. in BOTANY

### PLANT PHYSIOLOGY AND PLANT BIOCHEMISTRY (THEORY)

Program Name	BSc/ BOTANY	Semester	VI
Course Title	Plant Physiology and Plant Biochemistry (Theory)		
Course Code:	DSC7 - 21BSC6C7BOTL	No. of Credits	04
Contact hours	56 Hours	Duration of Exam	2 hours
Internal Assessment	40 marks	Semester end exam	60 marks

#### Course Pre-requisite (s):

**Course Outcomes (COs):** After the successful completion of the course, the student will be able to:

CO1. Understand the importance of water and the mechanism of transport.  
 CO2. Understand the biosynthesis and breakdown of biomolecules.  
 CO3. Understand the role of plant hormones in plant development and secondary metabolites.  
 CO4. Understanding of the basic functions and metabolism in a plant body.  
 CO5. Understand the importance of nutrients in plant metabolism and crop yield.

<b>Contents</b>	<b>56 hrs</b>
<b>UNIT 1</b>	<b>14 hrs</b>
<p><b>Plant water relations:</b> Importance of Water as a solvent, Diffusion, osmosis, imbibition, osmotic pressure, osmotic potential, turgor pressure, wall pressure, water potential and its components. Mechanism of water absorption, Factors affecting water absorption.</p> <p><b>Transpiration.</b> Types and process. Mechanism of guard cell movement. K<sup>+</sup> ion mechanism. Antitranspirants.</p> <p><b>Mechanism of ascent of sap:</b> Vital and physical force theories.</p> <p><b>Phloem Transport:</b> Transport of organic solutes. path of transport, vein loading, and unloading. Transcellular hypothesis, mass flow hypothesis.</p> <p><b>Mineral nutrition:</b> A brief account on Micro and macro nutrients.</p>	
<b>UNIT 2</b>	<b>14 Hrs</b>
<p><b>Photosynthesis:</b>              Photosynthetic Pigments (Chl a, b, xanthophylls, carotene); Photosystem I and II, reaction center, antenna molecules; Photophosphorylation (cyclic and Non-cyclic) Electron transport and mechanism of ATP synthesis; C<sub>3</sub>, C<sub>4</sub> and CAM pathways of carbon fixation; Photorespiration.</p> <p><b>Respiration:</b> Glycolysis, anaerobic respiration, TCA cycle; Oxidative phosphorylation, Glyoxylate, Oxidative Pentose Phosphate Pathway.</p> <p><b>Nitrogen metabolism:</b> Biological nitrogen fixation; Nitrate and ammonia assimilation.</p>	
<b>UNIT 3</b>	<b>08 hrs</b>
<p><b>Plant Growth Regulators:</b> Definition and classification of plant growth regulators- Hormones. Site of synthesis, biosynthesis pathway, and metabolism and influence on plant growth development of an individual group of hormone- Auxins, Gibberellins, cytokinins, ABA, ethylene.</p> <p>Synthetic growth regulators- classification, their effect on plant growth and development. practical utility in agriculture and horticulture.</p>	

<b>UNIT 4</b>	<b>06 hrs</b>
<b>Sensory Photobiology:</b> Biological clocks, photoperiodism, function & structure of phytochromes, phototropin & cryptochromes. Senescence, Aging & Cell Death (PCD and utophagosis). Plant Movements:	
<b>UNIT 5: Biochemistry</b>	<b>14 Hrs</b>
<b>Carbohydrate metabolism</b> <b>Enzymes</b> - classification, kinetics and mechanism of action. <b>Proteins and amino acids:</b> classification of amino acids, protein structure primary, secondary, tertiary and quaternary. <b>Vitamins</b> - classification, distribution, structure, production, function. <b>Lipids:</b> classification, structure, function and biosynthesis of fatty acids. <b>Secondary plant products:</b> structure, biosynthesis and distribution of terpenes, phenolics and nitrogen containing compounds.	

Course Title	<b>Plant Physiology and Biochemistry (Practical)</b>	Practical Credits	<b>2</b>
Course Code	<b>DSC7-21BSC6C7BOTP</b>	Contact Hours	<b>4 Hours</b>
Internal Assessment	<b>25 Marks</b>	Semester end exam	<b>25 Marks</b>
<b>Practical Content</b>			
<ol style="list-style-type: none"> <li>1. Experiment to demonstrate the phenomenon of exosmosis and endosmosis.</li> <li>2. To determine the osmotic pressure of the cell sap by plasmolytic method.</li> <li>3. To demonstrate root pressure/transpiration pull in plants.</li> <li>4. To compare the rate of transpiration from the two surfaces of the leaf by the cobalt chloride paper method.</li> <li>5. To demonstrate that oxygen is liberated in the process of photosynthesis.</li> <li>6. Separation of photosynthetic pigments by paper chromatography and measure their Rf values.</li> <li>7 Estimation of total chlorophyll content by Arnon method.</li> <li>7. To isolate and identify the amino acids from a mixture using paper chromatography.</li> <li>8. To Study of Phototropism.</li> <li>9. Quantities test for Starch, Protein, Reducing Sugars and Lipids.</li> <li>10. Estimation of TAN ( Titratable acid Number) from Bryophllum leaves/Aloe Vera ..</li> </ol>			

## **GENERAL PATTERN OF THEORY QUESTION PAPER**

**(60 marks for semester end Examination with 2 hrs duration)**

### **Part-A**

1. Question number 1 and sub-questions (a) to (j) carries 1 mark each. Answer all the sub-questions  
10 marks

### **Part-B**

2. Question number 02- 07 carries 05 Marks each. Answer any 04 questions: 20 marks

### **Part-C**

3. Question number 08-12 carries 10 Marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub-questions for 7+3 or 6+4 or 5+5 if necessary)

**Total: 60**

**Marks Note: Proportionate weightage shall be given to each unit based on number of hours prescribed.**

## **SCHEME OF PRACTICAL EXAMINATION**

### **PLANT PHYSIOLOGY AND PLANT BIOCHEMISTRY**

**Time =03 hrs**

**Marks =25**

- |   |          |
|---|----------|
| 1. Conduct Major Experiment A                 | 06 marks |
| 2. Comment on minor Experiments B & C         | 06 marks |
| 3. Micro Chemical test D                      | 03 marks |
| 4. Viva-voce                                  | 05 marks |
| 5. Practical Record + Industrial visit report | 05 marks |

## REFERENCES

1. Fundamentals of Biochemistry 2nd Ed, John Wiley and Sons Inc. Wilson, K. and Walker, J. 1994
2. Jain V K, 2008. Fundamentals of Plant Physiology. S Chand and Co.
3. Kochhar P L, Krishnamoorthy H N. Plant Physiology. Atmaram and sons, Delhi.
4. Kumar and Purohit. Plant Physiology: Fundamentals and Applications. Agrobotanical Publishers.
5. Malik CP, 2002. Plant Physiology. Kalyani publishers.
6. Mukherjee S, Ghosh AK, 2005. Plant Physiology. New Central Book Agency, Calcutta.
7. Noggle GR, Fritz GJ, Introductory Plant Physiology. Prentice Hall of India.
8. Pandey SN, Sinha BK, 2006. Plant physiology. Vikas Publishing House, New Delhi.
9. Salisbury F B, Ross C W, 1992. Plant Physiology. CBS publishers and Distributors, New Delhi.
10. Sinha A K, 2004. Modern Plant Physiology. Narosa publishing House, New Delhi.
11. Srivastava H S, 2004. Plant physiology and Biochemistry. Rasthogi publications.
12. Verma V, 2007. Text Book of Plant Physiology. Ane Books Pvt. Ltd.

## Cell Biology (Theory)

Program Name	<b>B.Sc. in BOTANY</b>	Semester	<b>V</b>
Course Title	<b>Cell Biology (Theory)</b>		
Course Code:	<b>DSC8 - 21BSC6C8BOTL</b>	No. of Credits	<b>04</b>
Contact hours	<b>56 Hours</b>	Duration of Exam	<b>2hours</b>
Internal Assessment	<b>40 marks</b>	Semester end exam	<b>60 marks</b>

<b>Course Pre-requisite (s):</b>	
<p><b>Course Outcomes (COs):</b> After the successful completion of the course, the student will be able to:</p> <p>CO1. Understand the Cell metabolism, chemical composition, physiochemical and functional organization of organelle</p> <p>CO2. Analyze the contemporary approaches in modern cell and molecular biology.</p> <p>CO3. Study the organization of cells, cell organelles, and biomolecules (i.e., protein, carbohydrate, lipid, and nucleic acid)</p> <p>CO4. Acquire the knowledge on the activities in which the diverse macro molecules and microscopic structures inhabiting the cellular world of life are engaged.</p> <p>CO5. Explain the various metabolic processes such as respiration, photosynthesis, etc. which are important for life.</p>	
<b>Contents</b>	<b>56 Hrs</b>
<b>Unit 1:</b>	<b>10 hrs</b>
Discovery of cell and Cell Theory; Cell wall, distribution, chemical composition, functions and variations in prokaryotic and eukaryotic cells (primary and secondary wall), Glycocalyx, Cell-cell interactions/ Junctions, pit connections, and Cytoskeleton	
<b>Unit 2:</b>	<b>15 hrs</b>
Structure and functions, active and passive transport, proton pumps associated (Na-K, Calmodulin, etc., and their distribution), phagocytosis, pinocytosis, exocytosis. Structural organization, function, marker enzymes of the cell organelles, biogenesis of mitochondria and chloroplasts, a brief account of transport in mitochondria and chloroplasts (Tim/Tom; Tic/Toc), and the semiautonomous nature of mitochondria and chloroplast	
<b>Unit 3:</b>	<b>15hrs</b>
Nuclear envelope, structure of nuclear pore complex, nuclear lamina, transport across nuclear membrane, Nucleolus, rRNA processing. Endoplasmic Reticulum – Structure, targeting and insertion of proteins in the ER, protein folding, processing; Smooth ER and lipid synthesis, export of proteins and lipids; Golgi Apparatus – organization, protein glycosylation, protein sorting and export from Golgi Apparatus; Lysosomes	
<b>Unit 4:</b>	<b>08 hrs</b>
Phases of the eukaryotic cell cycle, mitosis and meiosis; Regulation of cell cycle- checkpoints, role of protein kinases. Programmed Cell Death; Biology and elementary knowledge of development and causes of cancer.	
<b>Unit 5:</b>	<b>08 hrs</b>
<b>Techniques in cell biology:</b>	
Fixation and staining: Freeze drying, Microtome and Embedding. Cytochemical methods: Schiff's Reagent- Detection of aldehydes, Lipids detection by lipid soluble stain, Cell fractionation: Flow sorting cytometry, Differential or gradient centrifugation	

Course Title	<b>Cell Biology (Practical)</b>	Practical Credits	<b>02</b>
Course Code	<b>DSC 8 - 21BSC6C8BOTP</b>	Contact Hours	<b>4 Hours</b>
Internal Assessment	<b>25Marks</b>	Semester end exam	<b>25 Marks</b>
<b>Practical Content</b>			
1. Study of plant cell structure with the help of epidermal peel mount of Onion/ Rhoeo. 2. Study of cell and its organelles with the help of electron micrographs. 3. Measurement of length and breadth of the plant cell using micrometry. 4. Study different stages of mitosis and meiosis (Onion/ Rhoeo) 5. Study of Karyotype using camera-lucida / chart. 6. Isolation of cell organelle – Chloroplast. 7. Detection of Lipids, Aldehydes 8. Microtome sectioning, Fixation			

## **GENERAL PATTERN OF THEORY QUESTION PAPER**

**(60 marks for semester end Examination with 2 hrs duration)**

### **Part-A**

1. Question number 1-06 carries 2 marks each. Answer any 05 questions: 10 marks

### **Part-B**

4. Question number 07- 11 carries 05 Marks each. Answer any 04 questions: 20 marks

### **Part-C**

2. Question number 12-15 carries 10 Marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub-questions for 7+3 or 6+4 or 5+5 if necessary)

**Total: 60**

**Marks Note: Proportionate weightage shall be given to each unit based on number of hours prescribed.**

# SCHEME OF PRACTICAL EXAMINATION

(distribution of marks): 25 marks for the Semester end examination

## CELL BIOLOGY

Time =03 hrs

Marks =25

1. Preparation of squash/ smear of material A, identify, Sketch and label the any two stages with reasons  
06 marks
2. Find out the cell length and breadth of the given material using micrometry  
05 marks
3. Identify the slides C & D  
04 marks
4. Viva-voce  
05 marks
5. Detection of Aldehydes, Lipids (Journal/ Record + 5 slides)  
05 marks

**Total 25 marks**

### General instructions:

Q1. Give specimen from Onion/ Rhoec/ Crinum plant (A) Q2. Give specimen from Onion/ Rhoec leaf (B)

Q3. Give slide from mitosis (C) meiosis (D) Q4. Viva-voce

Q5. Submission (Journal/ Record + 5 slides)

**Note: The same Scheme may be used for the IA (Formative Assessment) examination**

References	
1	Cooper, G.M., Hausman, R.E. (2009). The Cell: A Molecular Approach, 5th edition. Washington, D.C.: ASM Press & Sunderland, Sinauer Associates, MA
2	Karp, G. (2010). Cell Biology, 6th edition. New Jersey, U.S.A.: John Wiley & Sons.
3	De Robertis, E. D. P. and De Robertis R. E. 2009. Cell and Molecular Biology, 8th edition. Lippincott Williams and Wilkins, Philadelphia.
4	Becker W. M., Kleinsmith L.J. and Bertni G. P. 2009. The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San fransisco.
5	Reven, F.H., Evert, R.F., Eichhorn, S.E. (1992). Biology of Plants. New York, NY: W.H.Freeman and Company
6	Alberts, B., Bray, D., Hopkin, K., Johnson, A. D., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2013). Essential cell biology (4th ed.). Garland Publishing.
7	Raven, F.H., Evert, R. F., Eichhorn, S.E. (1992).Biology of Plants. New York, NY: W.H. Freeman and Co.
8	Verma, P. S. (2004). Cell Biology,Genetics, Molecular Biology: Evoloution and Ecology. India: S. Chand Limited.

## Internship for graduate program (As per UGC & AICTE)

Course title	<b>B.Sc. in BOTANY</b>
No of contact hours	<b>90</b>
No of credits	<b>02</b>
Method of evaluation	<b>Presentations/ report submission / activity etc.</b>

- ❖ Internship shall be discipline-specific of 90 hours (2 credits) with a duration 4-6 weeks
- ❖ Internship may be full-time / part-time (full time during semester holidays and part time in the academic session)
- ❖ Internship mentor / supervisor shall avail work allotment during 6<sup>th</sup> semester for a maximum of 20 hours
- ❖ The student should submit the final internship report (90 hours of internship) to the mentor for completion of the internship
- ❖ The detailed guidelines and formats shall be formulated by the universities separately as prescribed in accordance to UGC and AICTE guidelines.