# DEPARTMENT OF BOTANY COURSE CURRICULUM & MARKING SCHEME B.Sc. III, IV, V, VI Semester

## BOTANY

(Based on Choice Based Credit System)

**SESSION : 2024-25** 



ESTD: 1958

## GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG, 491001 (C.G.)

(Former Name – Govt. Arts & Science College, Durg) NAAC Accredited Grade A<sup>+</sup>, College with CPE - Phase III (UGC), STAR COLLEGE (DBT) Phone : 0788-2212030 Website - www.govtsciencecollegedurg.ac.in, Email – <u>autonomousdurg2013@gmail.com</u>

## FOUR YEAR UNDERGRADUATE PROGRAM Semester III & IV

## Session 2024-25

## **SUBJECT - BOTANY**

## DSC

Paper No.	Title of the Paper	Marks Allotted		
		Theory	Internal	Min
Third Semester (Course Code- BBO103)	Plant Anatomy and Embryology (03 Credit)	80	20	40
BBOL03	Lab Course/ Practical (01 Credit)	50		20
	Total		150	
Four Semester (Course Code- BBO104)	Plant Physiology (03 Credit)	80	20	40
BBOL04	Lab course/ Practical (01 Credit)	5	0	20
	Total 150		150	

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## GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG FOUR YEAR UNDERGRADUATE PROGRAM DEPARTMENT OF BOTANY COURSE CURRICULUM 2024-25

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PART	A: INTRODUC	TION					
	Program:	Class: B.Sc.	Semester - III	Session: 2024-20	)25		
1	Course Code	BBO103					
2	Course Title	Plant Anatomy and	nd Embryology				
3	Course Type	DSC					
4	Course						
	Learning	• Know importance and scope of Plant anatomy and Embryology					
	Outcome	Understand	l the plant Shoot and Root	Apex organization.			
	(CLO)	Understance	l the process secondary gr	owth in Plants.			
		• Will get th	e knowledge of different	types of tissue system	and wood		
		structure in	plants.				
		Learn abou	t the reproduction in Plan	ts.			
1.5		Understand	the Anatomical anomalie	es in Plants.			
			understand about Pollinati				
5	Credit Value	3Credits		rs – Learning and Obser			
6	Total Marks		m Marks :100	Minimum Passing Ma	arks:40		
PAR		OF THE COURSE					
	Total	no. of Teaching/ Le	earning Periods = 45 Per	iods (45 Hours)			
Unit		Topics (C	COURSE CONTENTS)	74	No. of Periods		
Ι	shoot Apex organization.	organization, Root A Permanent Tissue	ation of Meristematic Tiss Apex and Types, Theory and types, Tissue systed d Vascular tissue system	related to Root Apex	10		
П	Internal Stru Monocot Str Growth in I	cture of Dicot and Mem, Internal Struct Dicot and Monocot	Monocot Root, Internal Si ure of Dicot and Mono Stem and its Significance on of Secondary Tissues i	ocot Leaf,Secondary e, Wood and Wood	10		
Ш	(Nyctanthes,	-	imary structure of Dicot uarina), Anomalous Se		10		
IV	Flower as	a reproductive of	rgan, Anther and Dev , Development of Female	· ·	10		
V	Mechanisms Events of Fe	and types of Polli	nation, Self-incompatibil rm and its type, Embryo a	ity, Fertilization and	10		

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S. No.	Category	Name of Nominated Members	Signature
1.	Chairperson	Dr. Ranjana Shrivastava	
2.	Members	1. Dr. G. S. Thakur	
		2. Dr. Shriram Kunjam	Sopian
		3. Dr. Satish Kumar Sen	a
		4. Dr. Vijay Laxmi Naidu	Myon
		5. Mr. Motiram Sahu	NOC?
		6. Dr. Rajeshwari Prabha Lahare	A
3.	Subject specialist	1. Prof. P.C. Panda Retd. Professor Borsi Durg C.G.)	X
		2. Dr. N.B. Singh (Govt. N. PG. Science College Raipur C.G.)	Mes
4.	VC Nominated member	Dr. Aruna Shrivastava (Govt. D.B. Girls PG College Raipur C.G.)	Ath
5.	Corporate/ Industrial area Representative	Shri Manish Jain (Apollo College, Durg C.G.)	eunst
6.	Ex Meritorious Student PG	Tanu Verma	Tyern?
7.	Subject expert from other Department	Dr. Divya Minz (Department of Zoology, Govt. V.Y.T. PG. Autonomous College Durg C.G.)	Durg

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### PART C - LEARNING RESOURCES

#### Text Books, Reference Books, Other Resources

#### **TEXT BOOKS Recommended :**

- Plant Anatomy Mauseth, J.D. 1988 The Benjamin/Cummings Publisher, USA
- Plant Anatomy Pandey, B.P. - S. Chand Publishing, New Delhi
- Embryology of Angiosperms Bhojwani, S.S. &Bhatanagar, S.P. - Vikas Publication House, New Delhi
- Embryology of Angiosperms Singh, Pandey, & Jain - Rastogi Publication, Meerut

#### **Reference Books**

- Integrative Plant Anatomy Dickison, W.C. 2000 Harcourt Academic Press, USA
- Plant Anatomy Fahn, A. 1974 Pergamon Press, USA
- Esau's Plant Anatomy: Meristems, Cells, and Tissues of the Plant Body: Their Structure, Function, and Development Evert, R.F. 2006 John Wiley and Sons, Inc.

### Online Resources: ( e- Resources/ e- Books/ e- Learning Portals)

#### https://epgp.inflibnet.ac.in/

PART D: ASSE	PART D: ASSESSMENT AND EVALUATION						
Suggested Cont	inuous Evaluation Methods:						
Maximum Mar	ks:	100 I	Aarks				
Continuous Con	nprehensive Evaluation (CCE):	20 M	arks				
Semester End E	Exam (SEE):	80 M	arks				
Internal Assess	ment:		Internal Test of 20 Marks e	ach and			
Continuous Comp	orehensive Evaluation (CCE)		Assignment of 20 Marks				
Semester End	Pattern -FOUR Questions (A, B						
Exam (SEE)	Question - A & B: (Compulsory)	Very	short answer type (02 each)	$04 \ge 5 = 20$ Marks			
	Question - C: Short answer type c	juestic	on	05 x 5 = 25 Marks			
Question -D: Long answer type of				07 x 5 = 35 Marks			
			Total	= 80 Marks			

S. No.	Category	Name of Nominated Members	Signature
1.	Chairperson	Dr. Ranjana Shrivastava	
2.	Members	1. Dr. G. S. Thakur	A
		2. Dr. Shriram Kunjam	500000
		3. Dr. Satish Kumar Sen	8
		4. Dr. Vijay Laxmi Naidu	Nitos
		5. Mr. Motiram Sahu	who a
		6. Dr. Rajeshwari Prabha Lahare	

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3.	Subject specialist	1. Prof. P.C. Panda Retd. Professor Borsi Durg C.G.)	Y
		2. Dr. N.B. Singh (Govt. N. PG. Science College Raipur C.G.)	Vez
4.	VC Nominated	Dr. Aruna Shrivastava (Govt. D.B. Girls PG College Raipur	Bh
	member	C.G.)	p.
5.	Corporate/	Shri Manish Jain (Apollo College, Durg C.G.)	20
	Industrial area	4.	CULIE
	Representative		1 10
6.	Ex Meritorious	Tanu Verma	Frang.
	Student PG		42
7.	Subject expert	Dr. Divya Minz (Department of Zoology, Govt. V.Y.T. PG.	$\cap$ 1
	from other	Autonomous College Durg C.G.)	1 fin
	Department		AP 1

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## GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG FOUR YEAR UNDERGRADUATE PROGRAM DEPARTMENT OF BOTANY COURSE CURRICULUM 2024-25

## Lab Course

	Program:	Class: B.Sc. Semester - III Session: 2024-2025
1 2 3 4	Program: Course Code Course Title Course Type Course Learning Outcome (CLO)	BBO103         Plant Anatomy and Embryology         DSC         This Course will enable the students to:         • Differentiate Plant Adaptations: Describe anatomical characteristics of hydrophytes and xerophytes.         • Identify Plant Anatomy: Recognize anatomical structures of monocot and dicot stems, leaves, and roots.         • Analyze Anomalous Structures: Explain primary anomalous structures in stems (Nyctanthes, Boerhaavia) and secondary growth in Dracaena and Bignonia.         • Examine Pollen: Describe pollen grain structures of Brassica, Hibiscus, Datura, and Solanum.
<ul> <li>Understand Placentation: Identify different types of plants (Pea, Hibiscus, Brassica, Sunflower, Dianthu</li> <li>Investigate Stem Anatomy: Analyze stem structur (monocot) and Helianthus (dicot) using permanent s</li> <li>Explore Root Anatomy: Differentiate root structur (monocot) and Helianthus (dicot) using permanent s</li> <li>Analyze Leaf Anatomy: Compare anatomical struct monocot leaves using permanent slides.</li> <li>Examine Adaptive Features: Describe adaptitix xerophytes (Nerium leaf) and hydrophytes (Hydrilla Study Anther and Tapetum: Differentiate young a structures and types of tapetum.</li> <li>Identify Ovule Types: Explain different types of ovulation of the structure of</li></ul>		<ul> <li>plants (Pea, Hibiscus, Brassica, Sunflower, Dianthus).</li> <li>Investigate Stem Anatomy: Analyze stem structures of Zea mays (monocot) and Helianthus (dicot) using permanent slides.</li> <li>Explore Root Anatomy: Differentiate root structures of Zea mays (monocot) and Helianthus (dicot) using permanent slides.</li> <li>Analyze Leaf Anatomy: Compare anatomical structures of dicot and monocot leaves using permanent slides.</li> <li>Examine Adaptive Features: Describe adaptive anatomy in xerophytes (Nerium leaf) and hydrophytes (Hydrilla stem).</li> <li>Study Anther and Tapetum: Differentiate young and mature anther</li> </ul>
5	Credit Value	1Credit 1 credit =30 Hours – Learning and Observation
6	Total Marks	Maximum Marks: 50 Minimum Passing Marks: 20
		OF THE COURSE
	No.	List of Experiments
_		characteristics of hydrophytes and xerophytes.
	2 Anatomy of I	Monocot/Dicot stem/leaf/root.
	growth in Dr	malous structure of stem (Nyctanthes, Boerhaavia) and Anomalous secondary acaena, Bignonia.
	4 Study the str	ucture of Pollen Grain {eg. Brassica, Hibiscus, Datura, Solanum}.

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5	Study the different types of Placentation (Axile, Basal, Marginal Parietal, Free central) {eg.				
	Pea, Hibiscus, Brassica, Sunflower, Dianthus}.				
6	Stem: Monocot: Zea mays; Dicot: Helianthus; Secondary: Helianthus (only Permanent				
	slides).				
7	Root: Monocot: Zea mays; Dicot: Helianthus; Secondary: Helianthus (only Permanent				
	slides).				
8	Leaf: Dicot and Monocot leaf (only Permanent slides).				
9	Adaptive anatomy: Xerophyte (Nerium leaf); Hydrophyte (Hydrilla stem).				
10	Structure of anther (young and mature), tapetum (amoeboid and secretory) (Permanent				
	slides).				
11	Types of ovules: Anatropous, Orthotropous, Circinotropous, Amphitropous/				
	Campylotropous.				
12	Calculation of percentage of germinated pollen in a given medium.				

S. No.	Category	Name of Nominated Members	Signature
1.	Chairperson	Dr. Ranjana Shrivastava	
2.	Members	1. Dr. G. S. Thakur	D
		2. Dr. Shriram Kunjam	Coron
		3. Dr. Satish Kumar Sen	Su
		4. Dr. Vijay Laxmi Naidu	VILOS
		5. Mr. Motiram Sahu	st2
		6. Dr. Rajeshwari Prabha Lahare	1º
3.	Subject specialist	1. Prof. P.C. Panda Retd. Professor Borsi Durg C.G.)	. P
		2. Dr. N.B. Singh (Govt. N. PG. Science College Raipur C.G.)	R
4.	VC Nominated member	Dr. Aruna Shrivastava (Govt. D.B. Girls PG College Raipur C.G.)	ACT
5.	Corporate/ Industrial area Representative	Shri Manish Jain (Apollo College, Durg C.G.)	eurint
6.	Ex Meritorious Student PG	Tanu Verma	Tuerna
7.	Subject expert from other Department	Dr. Divya Minz (Department of Zoology, Govt. V.Y.T. PG. Autonomous College Durg C.G.)	Dif

#### PART C: LEARNING RESOURCES

Text Books, Reference Books, Other Resources

### TEXT BOOKS Recommended:

- Plant Anatomy Mauseth, J.D. 1988 The Benjamin/Cummings Publisher, USA
- Plant Anatomy Pandey, B.P. S. Chand Publishing, New Delhi
- Embryology of Angiosperms Bhojwani, S.S. &Bhatanagar, S.P. Vikas Publication House, New Delhi
- Embryology of Angiosperms Singh, Pandey, & Jain Rastogi Publication, Meerut

#### **Reference Books:**

- Integrative Plant Anatomy Dickison, W.C. 2000 Harcourt Academic Press, USA
- Plant Anatomy Fahn, A. 1974 Pergamon Press, USA
- Esau's Plant Anatomy: Meristems, Cells, and Tissues of the Plant Body: Their Structure, Function, and Development - Evert, R.F. - 2006 - John Wiley and Sons, Inc.

#### Online Resources: ( e- Resources/ e- Books/ e- Learning Portals)

https://epgp.inflibnet.ac.in/

PART D: ASSESSMENT AND EVALUATION

**Suggested Continuous Evaluation Methods:** 

Maximum Marks: 50 Marks

(Will include Internal assessment, Lab records and End Semester Viva/Voce and performance)Semester End Exam (SEE)Laboratory performance: As per Dept. (LOCF)

. No.	Category	Name of Nominated Members	Signature
1,	Chairperson	Dr. Ranjana Shrivastava	
2.	Members	1. Dr. G. S. Thakur	A
		2. Dr. Shriram Kunjam	Cogan
		3. Dr. Satish Kumar Sen	8
		4. Dr. Vijay Laxmi Naidu	CHE
		5. Mr. Motiram Sahu	NOS
		6. Dr. Rajeshwari Prabha Lahare	de
3.	Subject specialist	1. Prof. P.C. Panda Retd. Professor Borsi Durg C.G.)	VI
		2. Dr. N.B. Singh (Govt. N. PG. Science College Raipur C.G.)	WA
4.	VC Nominated member	Dr. Aruna Shrivastava (Govt. D.B. Girls PG College Raipur C.G.)	Ach
5.	Corporate/ Industrial area Representative	Shri Manish Jain (Apollo College, Durg C.G.)	entitiest

6.	Ex Meritorious Student PG	Tanu Verma	ween
7.	Subject expert from other Department	Dr. Divya Minz (Department of Zoology, Govt. V.Y.T. PG. Autonomous College Durg C.G.)	Ang

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## GOVT. V.Y.T.PG AUTONOMOUS COLLEGE, DURG FOUR YEAR UNDERGRADUATE PROGRAM DEPARTMENT OF BOTANY COURSE CURRICULUM 2024-25

PART	A: INTRODUC	ΓΙΟΝ					
	Program:	Class: B.Sc. Semester	- IV	Session:2024-20	25		
1	Course Code	BBO104					
2	Course Title	Plant Physiology					
3	Course Type	DSC					
4	Course	This Course will enable the stud	lents to:				
	Learning Outcome (CLO)	<ul> <li>This Course will enable the students to:</li> <li>Explain Plant Water Relations: Understand diffusion, osmosis, imbibition, plasmolysis, water potential, soil water types, water absorption, and theories of ascent of sap.</li> <li>Describe Transpiration and Mineral Nutrition: Analyze transpiration, stomatal movement, factors affecting transpiration, mineral nutrition, deficiency symptoms, nitrogen fixation, and nitrate/ammonium uptake and assimilation.</li> <li>Understand Photosynthesis: Explain the photosynthetic apparatus, light reactions, ATP synthesis, electron and proton transport, carbon reduction pathways (C3, C4, CAM), photorespiration, and factors affecting photosynthesis.</li> <li>Differentiate Respiration Processes: Compare aerobic and anaerobic respiration, describe glycolysis, the Kreb's cycle, respiration factors, R.Q., glyoxylate pathway, alternative oxidase system, and pentose phosphate pathway.</li> <li>Identify Plant Hormones and Growth: Recognize the roles of auxin, cytokinin, gibberellin, ethylene, and abscisic acid. Understand flowering physiology, florigen concept, photoreceptors, photoperiodism, vernalization, seed dormancy, germination, and plant movement.</li> </ul>					
5	Credit Value	3 Credits 1 credit =	=15 Hou	rs – Learning and Obser	rvation		
6	Total Marks	Maximum Marks :100		Minimum Passing M	arks:40		
PAR		OF THE COURSE					
	Total	no. of Teaching/ Learning Periods	= 45 Per	riods (45 Hours)			
Unit		Topics (COURSE CONTENTS)					
I	osmotic pot capacity, wil	er relations: Diffusion, permeability, osmosis, imbibition, Plasmolysis, 10 potential and water potential, Types of soil water, water holding wilting, Absorption of water, theories of Ascent of sap.					
Π	Transpiration affecting transverse symptoms,	n, stomatal movement, significant nspiration, guttation. Mineral nutrition Biological Nitrogen fixation. Mech nmonium assimilation.	ce of toon and a	ranspiration, Factors bsorption, Deficiency	10		

m	Photosynthesis: Photosynthetic apparatus and pigments, light reaction mechanism of ATP synthesis. Photooxidation of water, mechanism of electron & proton transport (Hill reaction). C3, C4, CAM pathway of carbon reduction, photorespiration, factors affecting photosynthesis.	10
IV	Respiration: Aerobic and anaerobic respiration, Glycolysis, Kreb's cycle, factors affecting respiration, R.Q. Glyoxylate pathway, Alternative Oxidase system, Pentose Phosphate pathway.	10
V	Plant growth hormones: Auxin, Cytokinin,Gibberellin, Ethylene and Abscisic acid. Physiology of flowering, Florigen concept, Phytochromes &Cryptochromes, Photoperiodism and Vernalization. Seed dormancy and germination, Plant movement.	10

S. No.	Category	Name of Nominated Members	Signature
8.	Chairperson	Dr. Ranjana Shrivastava	-
9.	Members	1. Dr. G. S. Thakur	A
		2. Dr. Shriram Kunjam	Egian
		3. Dr. Satish Kumar Sen	a
		4. Dr. Vijay Laxmi Naidu	Mitard
		5. Mr. Motiram Sahu	MA
		6. Dr. Rajeshwari Prabha Lahare	A
10.	Subject specialist	1. Prof. P.C. Panda Retd. Professor Borsi Durg C.G.)	1. V
		2. Dr. N.B. Singh (Govt. N. PG. Science College Raipur C.G.)	MR
11.	VC Nominated member	Dr. Aruna Shrivastava (Govt. D.B. Girls PG College Raipur C.G.)	B
12.	Corporate/ Industrial area Representative	Shri Manish Jain (Apollo College, Durg C.G.)	annist
13.		Tanu Verma	They was
14.		Dr. Divya Minz (Department of Zoology, Govt. V.Y.T. PG. Autonomous College Durg C.G.)	Dij

## PART C - LEARNING RESOURCES

#### Text Books, Reference Books, Other Resources

## **TEXT BOOKS Recommended :**

- Introduction to Plant Physiology Hopkins, W.G. & Huner, P.A. John Wiley and Sons •
- Plant Physiology Pandey, S.N. & Sinha, B.K. Vikas Publishing, New Delhi
- Plant Physiology (5th edition) Taiz, L. & Zeiger, E. Sinauer Associates Inc., M.A, USA •
- Plant Physiology and Biotechnology Srivastava, H.S. Rastogi Publications, Meerut
- Experiments in Plant Physiology: A Laboratory Manual Bajracharya, D. 1999 Narosa Publishing House, New Delhi

#### **Reference Books**

- Fundamentals of Plant Physiology Jain, V.K. S. Chand Publishing, New Delhi
- Plant Physiology Salisbury, F.B. & Ross, C.W. Wadsworth Publishing, USA
- Plant Biochemistry Dey, P.M. & Harborne, J.B. Academic Press, USA •

### Online Resources: ( e- Resources/ e- Books/ e- Learning Portals)

https://	engn.	infl	ibnet	.ac.in/

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PART D: ASSE	SSMENT AND EVALUATION			
Suggested Cont	inuous Evaluation Methods:			
Maximum Mar	ks:	100 I	Aarks	
Continuous Con	mprehensive Evaluation (CCE):	<b>20</b> I	Aarks	
Semester End F	Cxam (SEE):	80 N	Aarks	
Internal Assessment: Internal Test of 20 Marks each and				ach and
Continuous Comp	orehensive Evaluation (CCE)		Assignment of 20 Marks	
Semester End	Pattern -FOUR Questions (A, B	, C, I	)from each Unit	
Exam (SEE)	Question - A & B: (Compulsory)	Very	short answer type (02 each)	$04 \ge 5 = 20$ Marks
	Question - C: Short answer type q	uestic	n	05 x 5 = 25 Marks
	Question - D: Long answer type q	uestic	n	07 x 5 = 35 Marks
			Total	= 80 Marks

S. No.	Category	Name of Nominated Members	Signature
8.	Chairperson	Dr. Ranjana Shrivastava	
9.	Members	1. Dr. G. S. Thakur	a
		2. Dr. Shriram Kunjam	( gazion
		3. Dr. Satish Kumar Sen	8
		4. Dr. Vijay Laxmi Naidu	Mos
		5. Mr. Motiram Sahu	Nose
		6. Dr. Rajeshwari Prabha Lahare	Ve

			D
10.	Subject specialist	1. Prof. P.C. Panda Retd. Professor Borsi Durg C.G.)	1
		2. Dr. N.B. Singh (Govt. N. PG. Science College Raipur C.G.)	Mas
11.	VC Nominated member	Dr. Aruna Shrivastava (Govt. D.B. Girls PG College Raipur C.G.)	Alt
12.	Corporate/ Industrial area Representative	Shri Manish Jain (Apollo College, Durg C.G.)	-eulust
13.	Ex Meritorious Student PG	Tanu Verma	Treing
14.	Subject expert from other Department	Dr. Divya Minz (Department of Zoology, Govt. V.Y.T. PG. Autonomous College Durg C.G.)	Prj

## GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG FOUR YEAR UNDERGRADUATE PROGRAM DEPARTMENT OF BOTANY COURSE CURRICULUM 2024-25

Lab Course

		: INTRODUC		
	Pr	ogram:	Class: B.Sc.Semester - IV Session:2024-2025	
1	Cou	rse Code	BBO104	
2	Cou	rse Title	Plant Physiology	
3		rse Type	DSC	
4				
5				
	Cre	edit Value	1 Credit 1 credit =30 Hours – Learning and Observation	
		edit Value tal Marks	1 Credit1 credit =30 Hours – Learning and ObservationMaximum Marks: 50Minimum Passing Marks: 20	
6	To	<b>tal</b> Marks	Maximum Marks: 50 Minimum Passing Marks: 20	
6 PA	To ART H	<b>tal</b> Marks	Maximum Marks: 50Minimum Passing Marks: 20OF THE COURSE	
6 PA	To ART H No.	tal Marks 3: CONTENT	Maximum Marks: 50       Minimum Passing Marks: 20         OF THE COURSE       List of Experiments	
6 PA S.	To ART H No. 1	tal Marks 3: CONTENT Demonstration	Maximum Marks: 50       Minimum Passing Marks: 20         OF THE COURSE       List of Experiments         In of transpiration.	
6 PA S.	Tot ART E No. 1 2	tal Marks 3: CONTENT Demonstration Determine the	Maximum Marks: 50       Minimum Passing Marks: 20         OF THE COURSE       List of Experiments         on of transpiration.       e rate of transpiration using Ganong's photometer.	
6 PA S.	<b>Tot</b> <b>ART E</b> <b>No.</b> 1 2 3	tal Marks 3: CONTENT Demonstration Determine the Demonstration	Maximum Marks: 50       Minimum Passing Marks: 20         OF THE COURSE         List of Experiments         on of transpiration.       e rate of transpiration using Ganong's photometer.         on of oxygen evolution in photosynthesis and factors affecting photosynthesis.	
6 PA S.	Tot ART E No. 1 2	tal Marks 3: CONTENT Demonstration Determine the Demonstration Comparison	Maximum Marks: 50       Minimum Passing Marks: 20         OF THE COURSE         List of Experiments         on of transpiration.         e rate of transpiration using Ganong's photometer.         on of oxygen evolution in photosynthesis and factors affecting photosynthesis.         of respiratory quotient (R.Q.) of different respiratory substrates.	
6 PA S.	<b>Tot</b> <b>ART E</b> <b>No.</b> 1 2 3	tal Marks 3: CONTENT Demonstration Determine the Demonstration Comparison	Maximum Marks: 50       Minimum Passing Marks: 20         OF THE COURSE         List of Experiments         on of transpiration.       e rate of transpiration using Ganong's photometer.         on of oxygen evolution in photosynthesis and factors affecting photosynthesis.	
6 P4 S.	To:           ART H           No.           1           2           3           4	tal Marks 3: CONTENT Demonstration Determine the Demonstration Comparison Determine the	Maximum Marks: 50       Minimum Passing Marks: 20         OF THE COURSE         List of Experiments         on of transpiration.         e rate of transpiration using Ganong's photometer.         on of oxygen evolution in photosynthesis and factors affecting photosynthesis.         of respiratory quotient (R.Q.) of different respiratory substrates.	
6 PA S.	Tot           ART H           No.           1           2           3           4           5	tal Marks 3: CONTENT Demonstration Determine the Demonstration Comparison Determine the Calculate the	Maximum Marks: 50       Minimum Passing Marks: 20         OF THE COURSE         List of Experiments         on of transpiration.         e rate of transpiration using Ganong's photometer.         on of oxygen evolution in photosynthesis and factors affecting photosynthesis.         of respiratory quotient (R.Q.) of different respiratory substrates.         e rate of transpiration using the four-leaf method.	
6 P4 S.	Tot           ART F           No.           1           2           3           4           5           6	tal Marks 3: CONTENT Demonstration Determine the Comparison Determine the Calculate the Determine the Study the e	Maximum Marks: 50       Minimum Passing Marks: 20         OF THE COURSE       List of Experiments         on of transpiration.       e rate of transpiration using Ganong's photometer.         on of oxygen evolution in photosynthesis and factors affecting photosynthesis.         of respiratory quotient (R.Q.) of different respiratory substrates.         e rate of transpiration using the four-leaf method.         e stomatal index of different mesophytic leaves.         e osmotic potential of plant cell sap using the plasmolytic method.         Effect of two environmental factors (light and wind) on transpiration in ar	
6 PA S.	Tot           ART F           No.           1           2           3           4           5           6           7	tal Marks 3: CONTENT Demonstration Determine the Demonstration Comparison Determine the Calculate the Determine the Study the endowing	Maximum Marks: 50       Minimum Passing Marks: 20         OF THE COURSE       List of Experiments         on of transpiration.       e rate of transpiration using Ganong's photometer.         on of oxygen evolution in photosynthesis and factors affecting photosynthesis.         of respiratory quotient (R.Q.) of different respiratory substrates.         e rate of transpiration using the four-leaf method.         e stomatal index of different mesophytic leaves.         e osmotic potential of plant cell sap using the plasmolytic method.         Effect of two environmental factors (light and wind) on transpiration in an analysis of the spiration in analysis of the	

11	Compare the rate of respiration in any two parts of a plant.	
12	Separate amino acids using paper chromatography.	

S. No.	Category	Name of Nominated Members	Signature
8,	Chairperson Dr. Ranjana Shrivastava		
9.	Members	1. Dr. G. S. Thakur	
		2. Dr. Shriram Kunjam	Consm
		3. Dr. Satish Kumar Sen	8r
		4. Dr. Vijay Laxmi Naidu	XHon
		5. Mr. Motiram Sahu	NAS
		6. Dr. Rajeshwari Prabha Lahare	A
10.	Subject specialist	1. Prof. P.C. Panda Retd. Professor Borsi Durg C.G.)	n P
		2. Dr. N.B. Singh (Govt. N. PG. Science College Raipur C.G.)	NB
11.	VC Nominated member	Dr. Aruna Shrivastava (Govt. D.B. Girls PG College Raipur C.G.)	ph
12.	Corporate/ Industrial area Representative	Shri Manish Jain (Apollo College, Durg C.G.)	ouwst
13.	Ex Meritorious Student PG	Tanu Verma	Juering.
14.		Dr. Divya Minz (Department of Zoology, Govt. V.Y.T. PG. Autonomous College Durg C.G.)	D'2

## PART C: LEARNING RESOURCES

#### Text Books, Reference Books, Other Resources

## TEXT BOOKS Recommended:

- Introduction to Plant Physiology Hopkins, W.G. & Huner, P.A. John Wiley and Sons
- Plant Physiology Pandey, S.N. & Sinha, B.K. Vikas Publishing, New Delhi
- Plant Physiology (5th edition) Taiz, L. & Zeiger, E. Sinauer Associates Inc., M.A, USA
- Plant Physiology and Biotechnology Srivastava, H.S. Rastogi Publications, Meerut
- Experiments in Plant Physiology: A Laboratory Manual Bajracharya, D. 1999 Narosa Publishing House, New Delhi

#### Reference Books:

- Fundamentals of Plant Physiology Jain, V.K. S. Chand Publishing, New Delhi
- Plant Physiology Salisbury, F.B. & Ross, C.W. Wadsworth Publishing, USA
- Plant Biochemistry Dey, P.M. & Harborne, J.B. Academic Press, USA
- Practical Manual of Plant Physiology and Biochemistry Dharmalingam, S. & Basu, R. -Scientific Publishers, India

#### Online Resources: ( e- Resources/ e- Books/ e- Learning Portals)

https://epgp.inflibnet.ac.in/

PART D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods: Maximum Marks: 50 Marks

(Will include laternal assessment, Lab records and End Semester Viva/Voce and performance)

Semester End Exam (SEE) Laboratory performance: As per Dept. (LOCF)

S. No.	Category	Name of Nominated Members	Signature
8.	Chairperson	Dr. Ranjana Shrivastava	
9.	Members	1. Dr. G. S. Thakur	
		2. Dr. Shriram Kunjam	8 april por
		3. Dr. Satish Kumar Sen	Sr
		4. Dr. Vijay Laxmi Naidu	Kappy
	-	5. Mr. Motiram Sahu	NO
		6. Dr. Rajeshwari Prabha Lahare	A
10.	Subject specialist	1. Prof. P.C. Panda Retd. Professor Borsi Durg C.G.)	P/

0 1

		2. Dr. N.B. Singh (Govt. N. PG. Science College Raipur C.G.)	Mas
11,	VC Nominated member	Dr. Aruna Shrivastava (Govt. D.B. Girls PG College Raipur C.G.)	Ash
12.	Corporate/ Industrial area Representative	Shri Manish Jain (Apollo College, Durg C.G.)	-ONM S
13.	Ex Meritorious Student PG	Tanu Verma	Surenweg.
14.	Subject expert from other Department	Dr. Divya Minz (Department of Zoology, Govt. V.Y.T. PG. Autonomous College Durg C.G.)	Dy

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## FOUR YEAR UNDERGRADUATE PROGRAM SEMESTER III & IV SESSION 2024-25

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## GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG FOUR YEAR UNDERGRADUATE PROGRAM DEPARTMENT OF BOTANY

## **COURSE CURRICULUM 2024-25**

	Program:	Class: B.Sc.	Semester -III	Session:	2024-2025
1	Course Code	-			
2	Course Title	Plant Resource	Utilization and Conservatio		
3	Course Type	DSE		n	
4	Course Learning				
	Outcome (CLO)	<ul> <li>Students will le as a resourc commercializat using modern te</li> <li>They will learn situ and ex-situ very soon due to</li> <li>Study of plant</li> </ul>	ion based on the need and ind echniques. about the different conservat conservation of plants that a biotic, abiotic and anthropog resource utilization will en technological skills in con	their don uction of m tion process re going to genic causes phance the	nestication odification ses like in- be extinct s. in specific
5	Credit Value	3 Credits			
6	Total Marks	3 Credits       1 credit =15 Hours – Learning and Observatio         Maximum Marks :100       Minimum Passing			
		Marks:40	Minin Minin	num Passin	g
PAR	T P. CONTENT OF				
	T B: CONTENT OF T				
	Total no. of 7	eaching/ Learning	g Periods = 45 Periods (45 H	lours)	
Unit		Topics (COURSI			No. of Periods
I	gram). Fiber crops Lemongrass, Eucaly (Groundnut, Soyabea	Jute & Cotton), Notus, Saffron & (	n, Evolution, Cultivation and Pulses (Wheat, Rice, Sugarca Medicinal and Aromatic plar Clove), Vegetable Oil-yieldi ard), and Spices.	ine, Black its (Mint, ing crops	10
II	wood plants and nor tannins, dyes (Heena,	ber-yielding plants -wood forest prod Sinduri) and resing	s (Sal, Teak, Shisham, Danda ucts (NFPs) such as bamboo	os, gums,	10
II	ethnobotany: Conce systems of medicine A on herbal Medicinal p	ot, history, evolutio yurveda, Unani and ants	n and scope; introduction to in I Siddha. Indian Traditional kr	nowledge	10
	Biodiversity: Biodive future of biodiversit	rsity scenario at gl	obal, national and regional le t of India and related inte		10
V	conventions, Biodiver (IUCN categories).	sity Hotspots in In	and world, threats to bio	diversity	

MAS

Plant Conservation: Principles of conservation, Strategies for in-situ conservation: sanctuaries, national parks and biosphere reserves. Strategies for ex-situ conservation: botanical gardens, field gene banks, seed banks, cryobanks.

10

5. No.		Name of Nominated Members	1
1.	Chairperson	Dr. Ranjana Shrivastava	Signature
		1. Dr. G. S. Thakur	A
		2. Dr. Shriram Kunjam	Lasa
		3. Dr. Satish Kumar Sen	Sala
		4. Dr. Vijay Laxmi Naidu	VILLOS
		5. Mr. Motiram Sahu	War
		6. Dr. Rajeshwari Prabha Lahare	er /
2.	Subject specialist	1. Prof. P.C. Panda Retd. Professor Borsi Durg C.G.)	9
		2. Dr. N.B. Singh (Govt. N.PG. Science College Raipur C.G.)	No.Y
3.	VC Nominated member	Dr. Aruna Shrivastava (Govt. D.B. Girls PG College Raipur C.G.)	May
4.	Corporate/ Industrial area	Shri Manish Jain (Apollo College, Durg C.G.)	AR -
	Representative		anniot
5.	Ex Meritorious Student PG	Tanu Verma	Typerrow,
6.	Subject expert from other Department	Dr. Divya Minz (Department of Zoology, Govt. V.Y.T. PG Autonomous College Durg C.G.)	And

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## PART C - LEARNING RESOURCES

## Text Books, Reference Books, Other Resources **TEXT BOOKS Recommended:**

- 1. Sharma, O. P. Hill's Economic Botany. Tata McGraw Hill Co. Ltd., New Delhi.
- 2. Swaminathan, M. S. and Kocchar, S. L. Plants and Society. Macmillan Publication Ltd., London. Thakur, R. S., Puri, H. S. and Husain, A Major Medicinal Plants of India. Central Institute of Medicinal and Aromatic Plants, CSIR, Lucknow.
- 3. S.K. Jain: Glimpses of Indian Ethnobotany
- 4. S.K. Jain, B.K. Sinha and R.C. Gupta: Notable plants in Ethnomedicine of India

## **Online Resources: (e- Resources/ e- Books/ e- Learning Portals)**

https://epgp.inflibnet.ac.in/

PART D: ASSI	ESSMENT AND EVALUATION			
Suggested Con Maximum Mar Continuous Co Semester End I	tinuous Evaluation Methods:` rks: mprehensive Evaluation (CCE): Exam (SEE):	100 N 20 N	Iarks Iarks Iarks	
Internal Assess Continuous Comp	ment: prehensive Evaluation (CCE)		Internal Test of 20 Marks of Assignment of 20 Marks	each and
Semester End	Pattern -FOUR Questions (A, B	<b>B</b> , <b>C</b> , <b>D</b> )	from each Unit	
Exam (SEE)	Question - A & B: (Compulsory) Question - C: Short answer type q	Very sl	hort answer type (02 each)	04 x 5 = 20 Marks 05 x 5 = 25 Marks
	Question -D: Long answer type qu			$03 \times 5 = 25$ Marks $07 \times 5 = 35$ Marks
			Total	= 80 Marks

## Name & Signature of Members of Board of Studies

. No.	Category	Name of Nominated Members	
7.	Chairperson	Dr. Ranjana Shrivastava	Signature
		1. Dr. G. S. Thakur	1
		2. Dr. Shriram Kunjam	ana
		3. Dr. Satish Kumar Sen	82
		4. Dr. Vijay Laxmi Naidu	VILOS
		5. Mr. Motiram Sahu	An
		6. Dr. Rajeshwari Prabha Lahare	- Contraction
8.	Subject specialist	1. Prof. P.C. Panda Retd. Professor Borsi Durg C.G.)	d' b
		2. Dr. N.B. Singh (Govt. N.PG. Science College Raipur C.G.)	10
9.	VC Nominated member	Dr. Aruna Shrivastava (Govt. D.B. Girls PG College Raipur C.G.)	K/2p

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10.	Corporate/ Industrial area Representative	Shri Manish Jain (Apollo College, Durg C.G.)	anmo
11.	Ex Meritorious Student PG	Tanu Verma	(0) w
12.	Subject expert from other Department	Dr. Divya Minz (Department of Zoology, Govt. V.Y.T. PG Autonomous College Durg C.G.)	01

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## GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG FOUR YEAR UNDERGRADUATE PROGRAM DEPARTMENT OF BOTANY COURSE CURRICULUM 2024-25 Lab Course

	I	Program:	Class: B.Sc.	Semester -III	Session:2024-2025	
1	C	ourse Code				
2		ourse Title	Plant Deserve IV(1)			
3 Course Type			Plant Resource Utilization and Conservation DSE			
4		urse Learning				
Outcome (CLO)Ability to identify and classify various plant specie economically important and endangered plants.• Proficiency in herbarium techniques, including the preservation, and documentation of plant specimens.• Development of practical skills in laboratory and field technic to plant resource utilization and conservation.• Ability to conduct research, analyze data, and present findin plant resource utilization and conservation.5 Credit Value1 Credit		cluding the collection nens. d field techniques relevan present findings related t <b>rning and Observation</b>				
6 DA		tal Marks	Maximum Marks: 50	Minim	um Passing Marks: 20	
		B: CONTENT (	OF THE COURSE			
S. 1	_		Lis	st of Experiments		
1	•	Extraction of e	ssential oil from aromatic	c plants.		
2.			nd uses of medicinal plants/Oil yielding plants/Spices/Food/Fodder.			
3.		Preparation of l	nerbal based product- a. T	Triphala b. Giloy Vati		
4.		Conservation	C. F	Amla Churna d. Aloe vera ge	21.	
5.		Eight - i'r C U	endangered/medicinal p	plant species in bioresource	garden.	
_	1	Field Visit: Coll	ection and preparation of	tion and preparation of herbarium and voucher specimen		
6.		Project work: C	ollection of ethnobotanic	cal data of plants used by loc	al people	
PAR	ГС	- LEARNING F	ESOURCES			
			Text Books, Reference	Books, Other Resources		
<b>EXT</b>	'BO	<b>OKS Recomme</b>				
Hill A	lber	t F. (1937) Econ	omic Botany. Mcgraw-H	II Dublication		
Cochi	nar	S (2016) E	Detaily. Wieglaw-II	in rudilcations.		
LOCIII	ai	5. (2010) ECOI	iomic Botany: A Con	prehensive Study. Cambr	idge University Press.	
01:10	0.101	7/978131628609	98.003			
	ui, 4	A.A. and Sreera	nu, B.S. (2005). Cultiva	ation of Medicinal and Aro	matic crops, University	
arroq						
arroq ress l	[nd. ]	Ltd., Hyderabad.			1 7	

# PART D: ASSESSMENT AND EVALUATION Suggested Continuous Evaluation Methods: Maximum Marks: 50 Marks (Will include Internal assessment, Lab records and End Semester Viva/Voce and performance) Semester End Exam (SEE) Laboratory performance: As per Dept. (LOCF)

## Name & Signature of Members of Board of Studies

S. No.	Category	Nome of N.	
13		Name of Nominated Members Dr. Ranjana Shrivastava	Signature
	4	1. Dr. G. S. Thakur	
		2. Dr. Shriram Kunjam	(C)
		3. Dr. Satish Kumar Sen	Sonia
		4. Dr. Vijay Laxmi Naidu	libr
		5. Mr. Motiram Sahu	XH0 0
		6. Dr. Rajeshwari Prabha Lahare	100
14.	Subject specialist	1. Prof. P.C. Panda Retd. Professor Borsi Durg C.G.)	9 8
	ø	2. Dr. N.B. Singh (Govt. N.PG. Science College Raipur C.G.)	the
15.	VC Nominated member	Dr. Aruna Shrivastava (Govt. D.B. Girls PG College Raipur C.G.)	R
16.	Corporate/ Industrial area Representative	Shri Manish Jain (Apollo College, Durg C.G.)	anno?
17.	Ex Meritorious Student PG	Tanu Verma	Trerma
18.	Subject expert from other Department	Dr. Divya Minz (Department of Zoology, Govt. V.Y.T. PG Autonomous College Durg C.G.)	Danh

## GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG FOUR YEAR UNDERGRADUATE PROGRAM

## DEPARTMENT OF BOTANY

## COURSE CURRICULUM 2024-25

	Program:	Class: B.Sc.	Semester -IV	Session: 2	024-2025
1	Course Code				024-2023
2	Course Title	INSTRUMENTA	TION AND LADOR		
3	Course Type	DSE	TION AND LABOR	RATORY TEC	HNIQUES
4	Course Learning				
	Outcome (CLO)	<ul> <li>To get the k laboratory.</li> <li>It will provide t technique and d</li> <li>Students can lea future preserva becoming rare d the lay people, t</li> <li>They can make a medicinal plants</li> </ul>	ill enable the student nowledge of different he knowledge of steril ifferent concept of so arn about the process tion of the species a lay by day due to defo puilding activities etc. different types of herb is locally available on	nt instrument lization, fixative lution of herbarium te s many of the prestation, over- arium sheets pa	e and stainin echnique and species are collection o
5	Credit Value	safe. 3 Credits	1 credit =15 Hours -	Loorning and	
6	Total Marks		ie ilouis -	- Learning and t	Ubservation
-	I Utal Marks	Maximum Marks •1			
PAR		Maximum Marks :		Minimum Passir	
PAR	T B: CONTENT OF	THE COURSE	.00 r	Minimum Passir	
PAR	T B: CONTENT OF Total no. of	THE COURSE Teaching/ Learning	00 r 9 Periods = 45 Period	Minimum Passir s (45 Hours)	
PAR Jnit	T B: CONTENT OF Total no. of INSTRUMEN	THE COURSE Teaching/ Learning TATION AND LA Topics (COURSE	00 F Periods = 45 Period BORATORY TECH CONTENTS)	Minimum Passir ls (45 Hours) INIQUES	ıg Marks:40 No. of
	T B: CONTENT OF Total no. of INSTRUMEN Microscopy: wor microscope, Phase	THE COURSE Teaching/ Learning TATION AND LA Topics (COURSE rking principles o Contrast, hot air over	900 F 9 Periods = 45 Period 10 BORATORY TECH 10 CONTENTS 11 Simple and com 10 incubators autoclass	Minimum Passir s (45 Hours) INIQUES	ng Marks:40
J <b>nit</b>	T B: CONTENT OF Total no. of INSTRUMEN Microscopy: wor microscope, Phase air flow chamber, c Chromatography: paper chromatogra exchange chromato	THE COURSE Teaching/ Learning TATION AND LA Topics (COURSE rking principles o Contrast, hot air over centrifuge, pH meter. Introduction, principles, phin layer Chi ophy, thin layer Chi ography, and column	900 F 9 Periods = 45 Period BORATORY TECH CONTENTS) f Simple and com 1, incubators, autoclave 1, incubators, autocla	Minimum Passin s (45 Hours) NIQUES pound light e, and laminar pplication of HPLC, Ion-	ng Marks:40 No. of Periods
Jnit	T B: CONTENT OF Total no. of INSTRUMEN Microscopy: wor microscope, Phase air flow chamber, c Chromatography: paper chromatogra exchange chromato Fixatives and sta methods of steriliz solutions, indicators	THE COURSE Teaching/ Learning TATION AND LA Topics (COURSE rking principles o Contrast, hot air over centrifuge, pH meter. Introduction, prince aphy, thin layer Chro ography, and column ains: principles, typ ation and culture meters, pH and buffers (Principles)	90 F Periods = 45 Period BORATORY TECH CONTENTS) f Simple and con a, incubators, autoclave Siple, methods and a comatography GLC	Minimum Passin s (45 Hours) NIQUES apound light e, and laminar pplication of HPLC, Ion- application; b, Concept of	ng Marks:40 No. of Periods 10
Init	Total no. of Total no. of INSTRUMEN Microscopy: wor microscope, Phase air flow chamber, of Chromatography: paper chromatogra exchange chromato Fixatives and sta methods of steriliz solutions, indicators ppm and percent sol and buffer. Field and herbariur specimen, Collectio (submersed aquatic bamboos)	THE COURSE Teaching/ Learning TATION AND LA Topics (COURSE rking principles o Contrast, hot air over centrifuge, pH meter. Introduction, prince phy, thin layer Chi ography, and column ains: principles, typ ation and culture me s, pH and buffers (Pr lutions; reagents (Action n techniques, preser n and preservation techniques, preser n and preservation techniques and preservation techniques and the second plant, succulent a	90 F 9 Periods = 45 Period 8 BORATORY TECH CONTENTS) 1 Simple and com 1, incubators, autoclave 1, incubators, autoclave 1, incubators, autoclave 1, incubators, autoclave 1, incubators, autoclave 1, incubators, autoclave 2, incubators, autocl	Minimum Passin s (45 Hours) NIQUES apound light e, and laminar pplication of HPLC, Ion- application; d, Concept of molal, molar, ndicators, pH ad herbarium ypes of plant , canes and	ng Marks:40 No. of Periods /0 /0

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of Data: Tabular, Graphical; Measures of central tendency: Arithmetic mean, mode, median; Measures of dispersion: Range, mean deviation, variation, standard deviation; Chi-square test.

S. No.	Surveyor	Name of Nominated Members	
1.	Chairperson	Dr. Ranjana Shrivastava	Signature
		1. Dr. G. S. Thakur	0
		2. Dr. Shriram Kunjam	Cap'm
		3. Dr. Satish Kumar Sen	and and
		4. Dr. Vijay Laxmi Naidu	Vitor
		5. Mr. Motiram Sahu	welson
		6. Dr. Rajeshwari Prabha Lahare	Arrow of
2.	Subject specialist	1. Prof. P.C. Panda Retd. Professor Borsi Durg C.G.)	der b
		2. Dr. N.B. Singh (Govt. N.PG. Science College Raipur C.G.)	10.
3.	VC Nominated member	Dr. Aruna Shrivastava (Govt. D.B. Girls PG College Raipur C.G.)	Ret
4.	Corporate/ Industrial area Representative	Shri Manish Jain (Apollo College, Durg C.G.)	MMint.
5.	Ex Meritorious Student PG	Tanu Verma	Sverma-
6.	Subject expert from other Department	Dr. Divya Minz (Department of Zoology, Govt. V.Y.T. PG Autonomous College Durg C.G.)	Ani

## PART C - LEARNING RESOURCES

## Text Books, Reference Books, Other Resources

## **TEXT BOOKS Recommended:**

- Biological Instrumentation & methodology (Tools and Techniques of Biology) (2012). P.K. Bajpai. S Chand & Company Pvt Ltd, Ram Nagar, New Delhi-110055
- 2. Narayanan P (2008) Essential of biophysics, New Age International Publishers, New Delhi.
- 3. Herman EB (2008) Media and Techniques for Growth, Regeneration and Storage 2005 2008. Agritech Publications, New York, USA.
- 4. Baruah BN (2006). B. Sc. Botany, Part I, Part II, Kalyani Publisher, Ludhiana.
- 5. Baruah BN (2011). B. Sc., Botany First and Second Semester, GU, Kalyani Publisher, Ludhiana.
- 6. Baruah BN (2016). Economic Botany, Sem III, Odisha University, Kalyani Publisher, Ludhiana.

## **Online Resources: (e- Resources/ e- Books/ e- Learning Portals)**

https://epgp.inflibnet.ac.in/

PART D: A	SSESSMENT AND EVALUATION	J	
Suggested	Continuous Evaluation Methods:		
Maximum	Marks:	100 Marks	
Continuou	s Comprehensive Evaluation (CCE	): 20 Marks	
Semester	End Exam (SEE):	80 Marks	
Internal As			1 . 1 4 .
Continuous	Comprehensive Evaluation (CCE)	Internal Test of 20 Marks eac 20 Marks	in and Assignment of
Semester	Pattern -FOUR Questions (A, B, C	C. D) from each Unit	S
End	Question - A & B: (Compulsory) Vo	erv short answer type (02 and)	04 5 80 8 4 4
Exam	Question - C: Short answer type que	estion	$04 \ge 5 = 20$ Marks
(SEE) Question -D: Long answer type ques		stion	05 x 5 = 25 Marks
	2. Zong unswer type que		07 x 5 = 35 Marks
		Total	= 80 Marks

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## Name & Signature of Members of Board of Studies

S. No.	Category	Name of Nominated Members	
1.	Chairperson	Dr. Ranjana Shrivastava	Signature
		1. Dr. G. S. Thakur	A
		2. Dr. Shriram Kunjam	Kania
		3. Dr. Satish Kumar Sen	Sh
		4. Dr. Vijay Laxmi Naidu	NILLAS
		5. Mr. Motiram Sahu	, velen
		6. Dr. Rajeshwari Prabha Lahare	her
2.	Subject specialist	1. Prof. P.C. Panda Retd. Professor Borsi Durg C.G.)	Way O
		2. Dr. N.B. Singh (Govt. N.PG. Science College Raipur C.G.)	hland
3.	VC Nominated member	Dr. Aruna Shrivastava (Govt. D.B. Girls PG College Raipur C.G.)	A
4.	Corporate/ Industrial area	Shri Manish Jain (Apollo College, Durg C.G.)	10-1
	Representative		amost
	Ex Meritorious Student PG	Tanu Verma	Greenna
	Subject expert from	Dr. Divara Ming (Denset of C. T. 1	Quest
	other Department	Dr. Divya Minz (Department of Zoology, Govt. V.Y.T. PG Autonomous College Durg C.G.)	Qui,

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## GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG FOUR YEAR UNDERGRADUATE PROGRAM DEPARTMENT OF BOTANY COURSE CURRICULUM 2024-25 Lab Course

#### PART A: INTRODUCTION **Program:** Class: B.Sc. Semester -IV Session:2024-2025 **Course Code** 1 2 **Course** Title INSTRUMENTATION AND LABORATORY TECHNIQUES **Course Type** 3 DSE 4 This Course will enable the students to: Course Learning • Understanding of the principles, components, and functions of basic Outcome laboratory instruments. (CLO) Ability to operate a variety of laboratory instruments such as spectrophotometers, chromatographs, microscopes, centrifuges, and pH meters. Knowledge and application of analytical techniques including spectroscopy, chromatography, electrophoresis, and titration. Skills in data collection, statistical analysis, and interpretation of . experimental results. • Understanding and application of laboratory safety protocols and compliance with regulatory standards and guidelines. 5 **Credit Value** 1 Credit 1 Credit =30 Hours – Learning and Observation 6 **Total Marks** Maximum Marks: 50 **Minimum Passing Marks: 20** PART B: CONTENT OF THE COURSE S. No. List of Experiments Preparation of solutions (normal, molal, molar, ppm and percent solutions) of known 1. concentrations using pure samples and stock solutions. Measurement of pH using pH meter. 2. Preparation of buffers (phosphate/ acetate buffer) 3. Determination of Plant pigments by Spectrophotometric method (absorption spectra). 4. Collection and Preservation of different plant sample (Aquatic plant/Alage/Succulent 5. plant/Tuber etc) Visit to some Laboratories outside the state. 6. PART C - LEARNING RESOURCES Text Books, Reference Books, Other Resources Willard HH, Merritt LL, Dean JA, Settle FA (1986) Instrumental Methods of Analysis. 6th Edition. . CBS Publishers and Distributors, New Delhi. Sharma BK (2002) Instrumental Methods of Chemical Analysis. 21st Edition, Goel Publishing • House, Meerut. **TEXT BOOKS Recommended:**

Online Resources: (e- Resources/ e- Books/ e- Learning Portals)

e-PG Pathshala - https://epgp.inflibnet.ac.in/

## PART D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

(Will include Internal assessment, Lab records and End Semester Viva/Voce and performance) Semester End Exam (SEE)

Laboratory performance: As per Dept. (LOCF)

## Name & Signature of Members of Board of Studies

S. No.		Name of Nominated Members	
1.	Chairperson	Dr. Ranjana Shrivastava	Signature
		1. Dr. G. S. Thakur	(1)
		2. Dr. Shriram Kunjam	ano
		3. Dr. Satish Kumar Sen	Sugar
		4. Dr. Vijay Laxmi Naidu	Vito
		5. Mr. Motiram Sahu	NAM SUN
	· · · · ·	6. Dr. Rajeshwari Prabha Lahare	- China -
2.	Subject specialist	1. Prof. P.C. Panda Retd. Professor Borsi Durg C.G.)	Qa
		2. Dr. N.B. Singh (Govt. N.PG. Science College Raipur C.G.)	the
3.	VC Nominated member	Dr. Aruna Shrivastava (Govt. D.B. Girls PG College Raipur C.G.)	D W
4.	Corporate/ Industrial area Representative	Shri Manish Jain (Apollo College, Durg C.G.)	on max
5.	Ex Meritorious Student PG	Tanu Verma	Freime
6.	Subject expert from other Department	Dr. Divya Minz (Department of Zoology, Govt. V.Y.T. PG Autonomous College Durg C.G.)	An

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## FOUR YEAR UNDERGRADUATE PROGRAM

## Semester V& VI

## **Session 2024-25**

## SUBJECT - BOTANY

## DSC

Paper No.	r No. Title of the Paper		Marks Allotted		
5.	- ej:			÷.	
		Theory	Internal	Min	
<b>Fifth Semester</b>	Cell and Molecular Biology				
(Course Code-	(03 Credit)	60	15	30	
<b>BBO105</b> )					
BBOL105	Lab Course/ Practical	25		10	
±	(01 Credit)				
	Total		150		
Sixth Semester	Genetics				
(Course Code-	(03 Credit)	60	15	30	
BBO106)		00	15		
BBOL106	Lab course/ Practical	2:	5	10	
	(01 Credit)	o 🗍	-		
	Total		150		

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## GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG FOUR YEAR UNDERGRADUATE PROGRAM DEPARTMENT OF BOTANY COURSE CURRICULUM 2024-25

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PA	PART A: INTRODUCTION					
Program:		Class: B.Sc. Semester - V Session:2024-2025				
1	Course Code	BBO105				
2	Course Title	Cell and Molecular Biology				
3	Course Type	DSC				
4	Course Learning Outcome (CLO)	<ul> <li>This Course will enable the students to:</li> <li>Understand cell theory and differentiate prokaryotic and eukaryotic cell structures.</li> <li>Demonstrate knowledge of cell cycle phases, mitosis, and meiosis.</li> <li>Identify and describe cellular organelles and their functions.</li> <li>Understand nucleus organization, chromosome structure, cytoskeleton roles, and programmed cell death mechanisms.</li> <li>Describe nucleic acid structure and function, including DNA and RNA types.</li> <li>Understand genetic elements like plasmids, transposable elements, and</li> </ul>				
5	Credit Value	<ul> <li>gene structure concepts.</li> <li>Explain mitochondrial and chloroplast genome organization.</li> <li>Explain DNA replication mechanisms, mutation types and understand DNA damage, repair, and genetic code properties.</li> <li>Describe transcription, translation processes, and RNA processing in prokaryotes.</li> <li>Explain gene regulation mechanisms and recombination processes.</li> <li>3 Credits 1 credit =15 Hours – Learning and Observation</li> </ul>				
6	Total Marks	Maximum Marks :75 Minimum Passing Marks:30				

	Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)						
Unit	Topics (COURSE CONTENTS)						
Ι	Cell: Cell theory. Prokaryotic cell structure: Function and ultra structure of cell,	10					
	Cytoskeleton, Eukaryotic cell: Plant cell wall. Plasma membrane: Structural						
	and Physiological Concepts. Cell Cycle: Cell division, Mitosis and Meiosis.						
II	Cytoplasm: Structure and Functions of Endoplasmic reticulum, Ribosome,	10					
	Golgi Complex, Lysosomes, Vacuoles, Mitochondria and Chloroplast. Nucleus						
	organization and Chromosome, Nucleosome Model. Programmed Cell Death.						
III	Nucleic Acid: Bases, Nucleoside and Nucleotide, Structure, Types and function	10					
	of DNA and RNA. Plasmids, C value Paradox, Structure of gene, old and new						
	concept. Mitochondrial and Chloroplast DNA.						
IV	DNA Replication: Enzyme involved and Mechanisms of DNA Replication.	10					
	Mutation: Molecular level of Mutation, Types of Mutagens, Spontaneous and						
	Induced Mutations. DNA damage and repair. Genetic code: Properties, Codon						
	assignment, Wobble Hypothesis						
V	Gene Expression: Transcription: Initiation, Elongation and Termination in	10					
	Prokaryotes. RNA Processing Translation: Initiation, Elongation and						
	Termination in Prokaryotes. Gene Regulation: Operon Concept, Promoter,						
	Operator, Regulator, Inducer and Co-repressor. Recombination: Homologous,						
	Non-Homologous and Site-Specific Recombination. RNA Interference: Mi						
	RNA and SiRNA.						

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S. No.	Category	Name of Nominated Members	Signature
1,	Chairperson	Dr. Ranjana Shrivastava	
2.	Members	1. Dr. G. S. Thakur	
		2. Dr. Shriram Kunjam	Option
		3. Dr. Satish Kumar Sen	S
		4. Dr. Vijay Laxmi Naidu	Viton
		5. Mr. Motiram Sahu	vor
		6. Dr. Rajeshwari Prabha Lahare	de
3.	Subject specialist	1. Prof. P.C. Panda Retd. Professor Borsi Durg C.G.)	2
		2. Dr. N.B. Singh (Govt. N. PG. Science College Raipur C.G.)	Mes
4.	VC Nominated member	Dr. Aruna Shrivastava (Govt. D.B. Girls PG College Raipur C.G.)	A
5.	Corporate/ Industrial area Representative	Shri Manish Jain (Apollo College, Durg C.G.)	-anmis
6.	Ex Meritorious Student PG	Tanu Verma	Trenng
7.	Subject expert from other Department	Dr. Divya Minz (Department of Zoology, Govt. V.Y.T. PG. Autonomous College Durg C.G.)	Qij

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#### **PART C - LEARNING RESOURCES**

#### Text Books, Reference Books, Other Resources

### **TEXT BOOKS Recommended:**

- Cell Biology, C. B. Powar, 2005, Himalaya Publishing House.
- Cell and Molecular Biology: Concepts and Experiments (7th ed.), G. Karp and J. G. Patton, 2013, Wiley.
- The Cell: A Molecular Approach, G. M. Cooper, 2000, ASM Press & Sinauer Associates.
- Genes and Genomes, P. Berg, 1983, University Science Books.
- Genomes 4, T. A. Brown, 2018, Garland Science.
- Principles and Techniques of Biochemistry and Molecular Biology (7th ed.), K. Wilson and J. Walker, 2010, Cambridge University Press.
- Principles of Cell and Molecular Biology (2nd ed.), L. J. Klein, Smith, and V. M. Kish, 1999, WCB/McGraw-Hill.
- Modern Genetic Analysis: Integrating Genes and Genomes, A. J. F. Griffiths, W. M. Gelbart, J. H. Miller, and R. C. Lewontin, 2002, W. H. Freeman.
- Molecular Biology of the Gene (7th ed.), J. D. Watson, T. A. Baker, S. P. Bell, A. Gann, M. Levine, and R. Losick, 2013, Pearson.
- Lehninger Principles of Biochemistry (7th ed.), D. L. Nelson and M. M. Cox, 2017, W. H. Freeman.
- Cell and Molecular Biology (2nd ed.), P. K. Gupta, 2003, Rastogi Publications.

#### **Reference Books:**

• Advanced Molecular Biology: A Concise Reference, R. M. Twyman, 2004, Garland Science.

Online Resources: (e- Resources/ e- Books/ e- Learning Portals)

https://epgp.inflibnet.ac.in/

## PART D: ASSESSMENT AND EVALUATION

**Suggested Continuous Evaluation Methods:** 

Maximum Marks:

75 Marks

Continuous Comprehensive Evaluation (CCE): 15 Marks

Semester End Exam (SEE):

60 Marks

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Internal Assessment:		Internal Test of 15 Marks and Assignment of 15 Marks	
Continuous Comp	rehensive Evaluation (CCE)		
Semester End Exam (SEE)	<b>Pattern -FOUR Questions (A, H</b> Question - A & B: (Compulsory) Question - C: Short answer type of	Very short answer type (01 each)	02 x 5 = 10 Marks 03 x 5 = 15 Marks
	Question - D: Long answer type of	question Total	07 x 5 = 35 Marks = 60 Marks

S. No.	Category	Name of Nominated Members	Signature
8.	Chairperson	Dr. Ranjana Shrivastava	
9.	Members	1. Dr. G. S. Thakur	Q
		2. Dr. Shriram Kunjam	(930an
		3. Dr. Satish Kumar Sen	8
		4. Dr. Vijay Laxmi Naidu	Villas
		5. Mr. Motiram Sahu	WERAN
		6. Dr. Rajeshwari Prabha Lahare	A
10.	Subject specialist	1. Prof. P.C. Panda Retd. Professor Borsi Durg C.G.)	V
		2. Dr. N.B. Singh (Govt. N. PG. Science College Raipur C.G.)	Ven
11.	VC Nominated member	Dr. Aruna Shrivastava (Govt. D.B. Girls PG College Raipur C.G.)	pt
12.	Corporate/ Industrial area Representative	Shri Manish Jain (Apollo College, Durg C.G.)	oning
13.	Ex Meritorious Student PG	Tanu Verma	Juerma.
14.	Subject expert from other Department	Dr. Divya Minz (Department of Zoology, Govt. V.Y.T. PG. Autonomous College Durg C.G.)	6mj

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# GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG FOUR YEAR UNDERGRADUATE PROGRAM **DEPARTMENT OF BOTANY** COURSE CURRICULUM 2024-25

#### Lab Course

PA	PART A: INTRODUCTION				
2	Program:	Class: B.Sc. Semester - V Session: 2024-2025			
1	Course Code	BBOL105			
2	Course Title	Cell and Molecular Biology			
3	Course Type	DSC			
4	Course Learning	This Course will enable the students to:			
165 	Outcome (CLO)	• Understand the principles and techniques of preparing pre-treating			
		agents, fixing solutions, and stains for cytological studies.			
		• Demonstrate proficiency in studying mitosis using root tips and			
		meiosis using flower buds, including the identification of mitotic			
	2	and meiotic stages. Also, perform cell counting, viability			
		assessments, and blood smear preparation, interpreting results for biological significance.			
		<ul> <li>Master techniques for preparing microscope slides of dicot leaf</li> </ul>			
		sections and Balsam leaf epidermal cells, identifying and			
		describing anatomical structures.			
	8	• Acquire skills in isolating chloroplasts, measuring stomatal cells,			
		and estimating DNA from plant cells using spectrophotometry or			
× .		fluorometry.			
		• Understand the principles and applications of RNA and DNA isolation, plasmid DNA isolation, and their roles in molecular			
		biology.			
		• Demonstrate practical skills in using spectrophotometry and			
	~	electrophoresis, designing and analyzing experiments in molecular			
	~	biology applications.			
5	Credit Value	1 Credit 1 credit =30 Hours – Learning and Observation			
6	Total Marks	Maximum Marks :25 Minimum Passing Marks:10			
PA	PART B: CONTENT OF THE COURSE				
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S. No.	List of Experiments
1	Preparation of pre-treating / fixing agents/ stains for cytological studies.
2	Study of Mitosis using root tips.
3	Study of Meiosis using flower buds.
4	Cell Counting and viability
5	Blood Smear Preparation
6	Preparation of microscope slide for Dicot leaf section
7	Isolation of chloroplasts.
8	Measurement of stomatal cells
9	Slide preparation of Balsam (Impatiens balsamina) Leaf Epidermal Cells
10	Isolation of DNA.
11	Isolation of RNA.
12	Plasmid DNA isolation
13	Estimation of DNA from plant cells.
14	Spectrophotometer, Electrophoresis,
15	Experiments (at least two) on the basis of electrophoresis.

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16.	Members	1. Dr. G. S. Thakur	R
		2. Dr. Shriram Kunjam	Cozon
		3. Dr. Satish Kumar Sen	8
		4. Dr. Vijay Laxmi Naidu	Vitas
		5. Mr. Motiram Sahu	10220
		6. Dr. Rajeshwari Prabha Lahare	A
17.	Subject specialist	1. Prof. P.C. Panda Retd. Professor Borsi Durg C.G.)	2/
		2. Dr. N.B. Singh (Govt. N. PG. Science College Raipur C.G.)	Way
18.	VC Nominated member	Dr. Aruna Shrivastava (Govt. D.B. Girls PG College Raipur C.G.)	Wh
19.	Corporate/ Industrial area Representative	Shri Manish Jain (Apollo College, Durg C.G.)	erling up.
20.	Ex Meritorious Student PG	Tanu Verma	rearing
21.	Subject expert from other Department	Dr. Divya Minz (Department of Zoology, Govt. V.Y.T. PG. Autonomous College Durg C.G.)	Dij

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#### PART C - LEARNING RESOURCES

#### Text Books, Reference Books, Other Resources

#### **TEXT BOOKS Recommended:**

- Principles of Genetics (6th ed.), D. P. Snustad and M. J. Simmons, 2008, John Wiley & Sons.
- Cell and Molecular Biology: Concepts and Experiments (7th ed.), G. Karp and J. G. Patton, 2013, Wiley.
- Principles and Techniques of Biochemistry and Molecular Biology (7th ed.), K. Wilson and J.
   Walker, 2010, Cambridge University Press.
- Molecular Biology of the Cell (6th ed.), B. Alberts, A. D. Johnson, J. Lewis, D. Morgan, M. Raff, and K. Roberts, 2014, Garland Science.
- Lehninger Principles of Biochemistry (7th ed.), D. L. Nelson and M. M. Cox, 2017, W. H. Freeman.
- Principles of Cell and Molecular Biology (2nd ed.), L. J. Klein, Smith, and V. M. Kish, 1999, WCB/McGraw-Hill.
- Reference Books:
- Cell Biology, C. B. Powar, 2005, Himalaya Publishing House.
- Advanced Molecular Biology: A Concise Reference, R. M. Twyman, 2004, Garland Science.
- Modern Microbial Genetics, U. N. Streips and R. E. Yasbin (Eds.), 2004, John Wiley & Sons.
- Fundamental Bacterial Genetics, N. Trun and J. Trempy, 2009, John Wiley & Sons.
- Introduction to Genetics: A Molecular Approach, T. A. Brown, 2011, Garland Science.

Online Resources: ( e- Resources/ e- Books/ e- Learning Portals)

https://epgp.inflibnet.ac.in/

#### PART D: ASSESSMENT AND EVALUATION

**Suggested Continuous Evaluation Methods:** 

**Maximum Marks:** 

#### 25 Marks

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(Will include Internal assessment, Lab records and End Semester Viva/Voce and performance)

Semester EndLaboratory performance: As per Dept. (LOCF)Exam (SEE)

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S. No.	Category	Name of Nominated Members	Signature
22.	Chairperson	Dr. Ranjana Shrivastava	
23.	Members	1. Dr. G. S. Thakur	A
		2. Dr. Shriram Kunjam	Comos
		3. Dr. Satish Kumar Sen	D
		4. Dr. Vijay Laxmi Naidu	Vitas
		5. Mr. Motiram Sahu	NAC
	v	6. Dr. Rajeshwari Prabha Lahare	1
24.	Subject specialist	1. Prof. P.C. Panda Retd. Professor Borsi Durg C.G.)	2
		2. Dr. N.B. Singh (Govt. N. PG. Science College Raipur C.G.)	hhz
25.	VC Nominated member	Dr. Aruna Shrivastava (Govt. D.B. Girls PG College Raipur C.G.)	pl.
26.	Corporate/ Industrial area Representative	Shri Manish Jain (Apollo College, Durg C.G.)	erwys,
27.	Ex Meritorious Student PG	Tanu Verma	Sverma
28.	Subject expert from other Department	Dr. Divya Minz (Department of Zoology, Govt. V.Y.T. PG. Autonomous College Durg C.G.)	Qinj'

# GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG FOUR YEAR UNDERGRADUATE PROGRAM DEPARTMENT OF BOTANY COURSE CURRICULUM 2024-25

Program:       Class: B.Sc.       Semester - VI       Session: 2024-2025         1       Course Code       BBO106
2       Course Title       Genetics         3       Course Type       DSC         4       Course Learning Outcome (CLO)       This Course will enable the students to: <ul> <li>Explain Mendel's inheritance principles and apply them to genetic crosses.</li> <li>Demonstrate knowledge of multiple alleles and allelic interaction with real-world examples.</li> <li>Understand linkage, gene mapping, and crossing over; create and interpret linkage maps.</li> <li>Understand sex determination mechanisms and explain chromosoma alterations.</li> <li>Acquire knowledge of cytoplasmic inheritance and population genetics principles; apply Hardy-Weinberg Equilibrium to genetic variation studies.</li> </ul> 5     Credit Value     3 Credits     1 credit=15 Hours – Learning and Observation         6       Total Marks       Maximum Marks :75       Minimum Passing Marks:30
3       Course Type       DSC         4       Course Learning Outcome (CLO)       This Course will enable the students to: <ul> <li>Explain Mendel's inheritance principles and apply them to genetic crosses.</li> <li>Demonstrate knowledge of multiple alleles and allelic interaction with real-world examples.</li> <li>Understand linkage, gene mapping, and crossing over; create an interpret linkage maps.</li> <li>Understand sex determination mechanisms and explain chromosoma alterations.</li> <li>Acquire knowledge of cytoplasmic inheritance and population genetics principles; apply Hardy-Weinberg Equilibrium to genetic variation studies.</li> </ul> <li>5</li> <li>Credit Value</li> <li>3 Credits</li> <li>1 credit =15 Hours – Learning and Observation</li> <li>Maximum Marks :75</li> <li>Minimum Passing Marks:30</li>
4       Course Learning Outcome (CLO)       This Course will enable the students to: <ul> <li>Explain Mendel's inheritance principles and apply them to genetic crosses.</li> <li>Demonstrate knowledge of multiple alleles and allelic interaction with real-world examples.</li> <li>Understand linkage, gene mapping, and crossing over; create and interpret linkage maps.</li> <li>Understand sex determination mechanisms and explain chromosoma alterations.</li> <li>Acquire knowledge of cytoplasmic inheritance and population genetics principles; apply Hardy-Weinberg Equilibrium to genetic variation studies.</li> </ul> 5     Credit Value     3 Credits     1 credit =15 Hours – Learning and Observation           6         Total Marks         Maximum Marks :75         Minimum Passing Marks:30
Outcome (CLO)       • Explain Mendel's inheritance principles and apply them to genetic crosses.         • Demonstrate knowledge of multiple alleles and allelic interaction with real-world examples.         • Understand linkage, gene mapping, and crossing over; create an interpret linkage maps.         • Understand sex determination mechanisms and explain chromosoma alterations.         • Acquire knowledge of cytoplasmic inheritance and population genetics principles; apply Hardy-Weinberg Equilibrium to genetic variation studies.         5       Credit Value       3 Credits       1 credit =15 Hours - Learning and Observation         6       Total Marks       Maximum Marks :75       Minimum Passing Marks:30
6     Total Marks     Maximum Marks :75     Minimum Passing Marks:30       PART B: CONTENT OF THE COURSE
PART B: CONTENT OF THE COURSE
Unit     Topics (COURSE CONTENTS)     No. of Periods
I Mendal's Principle: Mendelian genetic concepts; Mendel's experiments, 10
Concepts of Phenotype and Genotype; Heredity & Variation, Mendal's Law of
Inheritance; Law of Dominance, Law of Segregation; Monohybrid cross, Law
of Independent Assortment, Dihybrid cross, Back cross and Test cross.

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Π	Multiple Alleles: Definition, ABO blood groups and Rh factor in Human.	10
	Allelic interactions; Co-dominance and Incomplete dominance; Over-	
	dominance; Pleiotropy, lethal alleles, Penetrance and expressivity. Position	
	effect. Gene Interactions: Dominant epistasis, Recessive epistasis, Duplicate	
	recessive epistasis, Duplicate dominant interaction, Dominant and recessive	
	interaction (with an example for each trait).	
III	Linkage and Gene Mapping: Chromosomal basis of inheritance, Linkage	10
	definition, cis and trans arrangement of genes. Types of linkage, complete and	
	incomplete linkage maps. Crossing over; definition; recombination and	
	recombination frequency, Mechanism of crossing over: Coupling and	
	Repulsion hypothesis. Mitotic crossing over, Factors affecting linkage and	
	crossing over, significance of linkage and crossing over	
***		
IV	Sex determination and Extra-nuclear inheritance: Chromosome theory of	10
IV	Sex determination and Extra-nuclear inheritance: Chromosome theory of Sex determination: XX- XY, XX-XO, ZZ-ZW; Intersexes and Super sexes in	10
IV		10
IV	Sex determination: XX- XY, XX-XO, ZZ-ZW; Intersexes and Super sexes in	10
IV	Sex determination: XX- XY, XX-XO, ZZ-ZW; Intersexes and Super sexes in <i>Drosophila</i> , Y chromosome in sex determination of <i>Melandrium</i> . Genetic and	10
IV	Sex determination: XX- XY, XX-XO, ZZ-ZW; Intersexes and Super sexes in <i>Drosophila</i> , Y chromosome in sex determination of <i>Melandrium</i> . Genetic and Hormonal control of Sex determination: Gynandromorphs, Environment and	10
IV V	Sex determination: XX- XY, XX-XO, ZZ-ZW; Intersexes and Super sexes in <i>Drosophila</i> , Y chromosome in sex determination of <i>Melandrium</i> . Genetic and Hormonal control of Sex determination: Gynandromorphs, Environment and sex determination. Numerical and Structural alterations in Chromosomes,	10 10
	Sex determination: XX- XY, XX-XO, ZZ-ZW; Intersexes and Super sexes in <i>Drosophila</i> , Y chromosome in sex determination of <i>Melandrium</i> . Genetic and Hormonal control of Sex determination: Gynandromorphs, Environment and sex determination. Numerical and Structural alterations in Chromosomes, Polyploidy & Aneuploidy.	
	<ul> <li>Sex determination: XX- XY, XX-XO, ZZ-ZW; Intersexes and Super sexes in <i>Drosophila</i>, Y chromosome in sex determination of <i>Melandrium</i>. Genetic and Hormonal control of Sex determination: Gynandromorphs, Environment and sex determination. Numerical and Structural alterations in Chromosomes, Polyploidy &amp; Aneuploidy.</li> <li>Characteristic features of Cytoplasmic Inheritance; Inheritance of</li> </ul>	
	<ul> <li>Sex determination: XX- XY, XX-XO, ZZ-ZW; Intersexes and Super sexes in <i>Drosophila</i>, Y chromosome in sex determination of <i>Melandrium</i>. Genetic and Hormonal control of Sex determination: Gynandromorphs, Environment and sex determination. Numerical and Structural alterations in Chromosomes, Polyploidy &amp; Aneuploidy.</li> <li>Characteristic features of Cytoplasmic Inheritance; Inheritance of Mitochondrial Genome, Chloroplast Genome, Kappa particles in <i>Paramecium</i>,</li> </ul>	
	<ul> <li>Sex determination: XX- XY, XX-XO, ZZ-ZW; Intersexes and Super sexes in <i>Drosophila</i>, Y chromosome in sex determination of <i>Melandrium</i>. Genetic and Hormonal control of Sex determination: Gynandromorphs, Environment and sex determination. Numerical and Structural alterations in Chromosomes, Polyploidy &amp; Aneuploidy.</li> <li>Characteristic features of Cytoplasmic Inheritance; Inheritance of Mitochondrial Genome, Chloroplast Genome, Kappa particles in <i>Paramecium</i>, Sigma factor in <i>Drosophila</i>, Shell coiling in Snail. Dosage compensation; Sex-</li> </ul>	
	<ul> <li>Sex determination: XX- XY, XX-XO, ZZ-ZW; Intersexes and Super sexes in <i>Drosophila</i>, Y chromosome in sex determination of <i>Melandrium</i>. Genetic and Hormonal control of Sex determination: Gynandromorphs, Environment and sex determination. Numerical and Structural alterations in Chromosomes, Polyploidy &amp; Aneuploidy.</li> <li>Characteristic features of Cytoplasmic Inheritance; Inheritance of Mitochondrial Genome, Chloroplast Genome, Kappa particles in <i>Paramecium</i>, Sigma factor in <i>Drosophila</i>, Shell coiling in Snail. Dosage compensation; Sexlinked, sex-limited and sex-influenced characters Male Sterility in plants and</li> </ul>	

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S. No.	Category	Name of Nominated Members	Signature
1.	Chairperson	Dr. Ranjana Shrivastava	
2.	Members	1. Dr. G. S. Thakur	A
		2. Dr. Shriram Kunjam	Com
		3. Dr. Satish Kumar Sen	8
2		4. Dr. Vijay Laxmi Naidu	Villas
		5. Mr. Motiram Sahu	MPR 3-
		6. Dr. Rajeshwari Prabha Lahare	d
3.	Subject specialist	1. Prof. P.C. Panda Retd. Professor Borsi Durg C.G.)	21
		2. Dr. N.B. Singh (Govt. N. PG. Science College Raipur C.G.)	When
4.	VC Nominated member	Dr. Aruna Shrivastava (Govt. D.B. Girls PG College Raipur C.G.)	At
5.	Corporate/ Industrial area Representative	Shri Manish Jain (Apollo College, Durg C.G.)	angr.
6.	Ex Meritorious Student PG	Tanu Verma	Trerme
7.	Subject expert from other Department	Dr. Divya Minz (Department of Zoology, Govt. V.Y.T. PG. Autonomous College Durg C.G.)	Rij

#### **PART C - LEARNING RESOURCES**

#### Text Books, Reference Books, Other Resources

#### **TEXT BOOKS Recommended:**

- An Introduction to Genetic Analysis (7th ed.), A. J. F. Griffiths, J. H. Miller, D. T. Suzuki, R. C. Lewontin, and W. M. Gelbart, 2000, W. H. Freeman.
- Concepts of Genetics, W. S. Klug, M. R. Cummings, and C. A. Spencer, 2005, Benjamin-Cummings Publishing Company.
- Concepts of Genetics (10th ed.), W. S. Klug, M. R. Cummings, C. Spencer, and M. A. Palladino, 2020, Pearson.
- Genetic Analysis: An Integrated Approach (2nd ed.), M. F. Sanders and J. L. Bowman, 2014, Pearson.
- Genetics: From Genes to Genomes (4th ed.), L. Hartwell, M. L. Goldberg, A. E. Reynolds, and L. M. Silver, 2009, McGraw-Hill.
- Genetics: A Conceptual Approach (7th ed.), B. A. Pierce, 2000, Macmillan.
- Genetics: Analysis & Principles (7th ed.), R. J. Brooker, 2015, McGraw-Hill.
- Genetics: Analysis of Genes and Genomes (5th ed.), D. L. Hartl, 2014, Jones and Bartlett Publishers.
- Molecular Cell Biology (6th ed.), H. Lodish, A. Berk, C. A. Kaiser, M. Krieger, A. Bretscher, H. Ploegh, A. Amon, and M. P. Scott, 2008, Macmillan.
- Principles of Genetics (6th ed.), D. P. Snustad and M. J. Simmons, 2008, John Wiley & Sons.
- Fundamentals of Genetics, B. D. Singh, 2010, Kalvani Publications.

#### **Reference Books:**

- Modern Microbial Genetics, U. N. Streips and R. E. Yasbin (Eds.), 2004, John Wiley & Sons.
- Fundamental Bacterial Genetics, N. Trun and J. Trempy, 2009, John Wiley & Sons.
- Cytogenetics, P. K. Gupta, 2010, Rastogi Publications.
- Introduction to Genetics: A Molecular Approach, T. A. Brown, 2011, Garland Science.
- Drosophila: A Laboratory Handbook (2nd ed.), M. Ashburner, 2005, Cold Spring Harbor Laboratory Press.

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PART D: ASSESSMENT AND EVALUATION	
Suggested Continuous Evaluation Methods:	
Maximum Marks:	75 Marks
<b>Continuous Comprehensive Evaluation (CCE):</b>	15 Marks
Semester End Exam (SEE):	60 Marks
Internal Assessment:	Internal Test of 15 Marks and Assignment of 15 Marks
Continuous Comprehensive Evaluation (CCE)	
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Semester End	Pattern -FOUR Questions (A, B, C, D) from each Unit	
	Question - A & B: (Compulsory) Very short answer type (01 each)	$02 \ge 5 = 10$ Marks
	Question - C: Short answer type question	03 x 5 = 15 Marks
	Question - D: Long answer type question	07 x 5 = 35 Marks
	Total	= 60 Marks

S. No.	Category	Name of Nominated Members	Signature
8.	Chairperson	Dr. Ranjana Shrivastava	
9.	Members	1. Dr. G. S. Thakur	R
		2. Dr. Shriram Kunjam	Corsion
		3. Dr. Satish Kumar Sen	à
		4. Dr. Vijay Laxmi Naidu	sitos
		5. Mr. Motiram Sahu	Not the state
		6. Dr. Rajeshwari Prabha Lahare	nat
10.	Subject specialist	1. Prof. P.C. Panda Retd. Professor Borsi Durg C.G.)	V
		2. Dr. N.B. Singh (Govt. N. PG. Science College Raipur C.G.)	Way
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14.	Subject expert from other Department	Dr. Divya Minz (Department of Zoology, Govt. V.Y.T. PG. Autonomous College Durg C.G.)	Diz

# GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG FOUR YEAR UNDERGRADUATE PROGRAM DEPARTMENT OF BOTANY

#### COURSE CURRICULUM 2024-25

#### Lab Course

Program:       Class: B.Sc.       Semester - VI       Session:2024-2025         1       Course Type       BBOL106	PA]	RT A: I	NTRODUCT	ΓΙΟΝ			
2       Course Title       Genetics         3       Course Type       DSC         4       Course Learning Outcome (CLO)       This Course will enable the students to: <ul> <li>Students will prepare and apply fixing agents, stains, and stumitosis using root tips and meiosis using flower buds.</li> <li>Students will prepare and analyze salivary gland chromosomes Chironomus and Drosophila larvae.</li> <li>Students will perform blood typing for ABO and Rh factors a conduct hemoglobin electrophoresis.</li> <li>Students will solve monohybrid and dihybrid cross probler address non-Mendelian inheritance, linkage, crossing over, a construct genetic maps.</li> <li>Students will construct and analyze pedigrees, assess inheritance quantitative characters, and score dysmorphic features in syndrom patients.</li> <li>Students will learn and apply genetic counseling communicati processes for genetic testing.</li> </ul> 5     Credit Value     1 Credit       1 credit=30 Hours – Learning and Observation 6         6       Total Marks       Maximum Marks:25       Minimum Passing Marks:10         PART B: CONTENT OF THE COURSE             3       Study of Mitosis using root tips.           3       Study of Mitosis using flower buds.           4       Preparation of salivary gland chromosomes in <i>Chironomous</i> larvae           5		Prog	ram:	Class:	B.Sc.	Semester - VI	Session:2024-2025
2       Course Title       Genetics         3       Course Type       DSC         4       Course Learning Outcome (CLO)       This Course will enable the students to: <ul> <li>Students will prepare and apply fixing agents, stains, and stumitosis using root tips and meiosis using flower buds.</li> <li>Students will prepare and analyze salivary gland chromosomes Chironomus and Drosophila larvae.</li> <li>Students will perform blood typing for ABO and Rh factors a conduct hemoglobin electrophoresis.</li> <li>Students will construct and analyze pedigrees, assess inheritance quantitative characters, and score dysmorphic features in syndron patients.</li> <li>Students will learn and apply genetic counseling communicati processes for genetic testing.</li> </ul> 5       Credit Value       1 Credit       1 credit=30 Hours – Learning and Observation faing agents/stains for cytological studies.         2       Study of Mitosis using root tips.       3 Study of Mitosis using flower buds.         4       Preparation of pre-treating / fixing agents/stains for cytological studies.         2       Study of Mitosis using flower buds.         4       Preparation of salivary gland chromosomes in <i>Chironomous</i> larvae         5       Preparation of salivary gland chromosomes in <i>Drosophila</i> larvae         6       Blood typing in humans for multiple alleles and Rh factor         7       Genetic Problems on Monohybrid cross,	1	Course	e Code	BBOL	106		34 34
4       Course Learning Outcome (CLO)       This Course will enable the students to: <ul> <li>Students will prepare and apply fixing agents, stains, and stumitosis using root tips and meiosis using flower buds.</li> <li>Students will prepare and analyze salivary gland chromosomes Chironomus and Drosophila larvae.</li> <li>Students will perform blood typing for ABO and Rh factors a conduct hemoglobin electrophoresis.</li> <li>Students will solve monohybrid and dihybrid cross probler address non-Mendelian inheritance, linkage, crossing over, a construct genetic maps.</li> <li>Students will construct and analyze pedigrees, assess inheritance quantitative characters, and score dysmorphic features in syndrom patients.</li> <li>Students will learn and apply genetic counseling communicati processes for genetic testing.</li> </ul> <li>5</li> <li>Credit Value 1 Credit 1 credit =30 Hours - Learning and Observation 6</li> <li>Total Marks Maximum Marks :25 Minimum Passing Marks:10 PART B: CONTENT OF THE COURSE</li> <li>Study of Mitosis using root tips.</li> <li>3</li> <li>Study of Mitosis using flower buds.</li> <li>4</li> <li>Preparation of pre-treating / fixing agents/ stains for cytological studies.</li> <li>2</li> <li>Study of Meiosis using flower buds.</li> <li>4</li> <li>Preparation of salivary gland chromosomes in <i>Chironomous</i> larvae</li> <li>5</li> <li>Preparation of salivary gland chromosomes in <i>Drosophila</i> larvae</li> <li>6</li> <li>Blood typing in humans for multiple alleles and Rh factor</li> <li>7</li> <li>Genetic Problems on Monohybrid cross,</li>	2						V
Outcome (CLO)       Students will prepare and apply fixing agents, stains, and stumitosis using root tips and meiosis using flower buds.         Students will prepare and analyze salivary gland chromosomes Chironomus and Drosophila larvae.       Students will prepare and analyze salivary gland chromosomes Chironomus and Drosophila larvae.         Students will perform blood typing for ABO and Rh factors a conduct hemoglobin electrophoresis.       Students will solve monohybrid and dihybrid cross problem address non-Mendelian inheritance, linkage, crossing over, a construct genetic maps.         Students will construct and analyze pedigrees, assess inheritance quantitative characters, and score dysmorphic features in syndron patients.         Students will learn and apply genetic counseling communicati processes for genetic testing.         Students will learn and apply genetic counseling communicati processes for genetic testing.         Marks       Maximum Marks :25         Maximum Marks :25       Minimum Passing Marks:10         PART B: CONTENT OF THE COURSE         Study of Mitosis using root tips.         Study of Mitosis using root tips.         Study of Meiosis using flower buds.         Preparation of salivary gland chromosomes in <i>Chironomous</i> larvae         Preparation of salivary gland chromosomes in <i>Drosophila</i> larvae         Blood typing in humans for multiple alleles and Rh factor         Genetic Problems on Monohybrid cross,	3	Course	е Туре	DSC			-
<ul> <li>Students Will prepare and apply suing opene, stains, and stain mitosis using root tips and meiosis using flower buds.</li> <li>Students will prepare and analyze salivary gland chromosomes Chironomus and Drosophila larvae.</li> <li>Students will perform blood typing for ABO and Rh factors a conduct hemoglobin electrophoresis.</li> <li>Students will solve monohybrid and dihybrid cross probler address non-Mendelian inheritance, linkage, crossing over, a construct genetic maps.</li> <li>Students will construct and analyze pedigrees, assess inheritance quantitative characters, and score dysmorphic features in syndron patients.</li> <li>Students will learn and apply genetic counseling communicati processes for genetic testing.</li> <li>Students Will learn and apply genetic counseling munication for the COURSE</li> <li>S. No.</li> <li>List of Experiments</li> <li>Preparation of pre-treating / fixing agents/ stains for cytological studies.</li> <li>Study of Mitosis using flower buds.</li> <li>Preparation of salivary gland chromosomes in <i>Chironomous</i> larvae</li> <li>Preparation of salivary gland chromosomes in <i>Drosophila</i> larvae</li> <li>Blood typing in humans for multiple alleles and Rh factor</li> <li>Genetic Problems on Monohybrid cross,</li> </ul>	4	Course	e Learning	This	Course wil	l enable the students t	to:
S       Credit Value       1 Credit       1 credit =30 Hours - Learning and Observation         6       Total Marks       Maximum Marks :25       Minimum Passing Marks:10         PART B: CONTENT OF THE COURSE       Store Course       Store Course       Store Course         1       Preparation of pre-treating / fixing agents/ stains for cytological studies.       2       Study of Mitosis using root tips.         3       Study of Mitosis using flower buds.       Preparation of salivary gland chromosomes in <i>Chironomous</i> larvae       Salivary gland chromosomes in <i>Drosophila</i> larvae         5       Preparation of salivary gland chromosomes in <i>Drosophila</i> larvae       Blood typing in humans for multiple alleles and Rh factor         7       Genetic Problems on Monobybrid cross,	0		•	mitosis usi Students v Chironomu Students v conduct he Students v address na construct g Students w quantitativ	ng root tips and meiosi vill prepare and analy us and Drosophila larva vill perform blood typ moglobin electrophore will solve monohybr on-Mendelian inherita genetic maps. vill construct and analy	s using flower buds. ze salivary gland chromosomes in the. bing for ABO and Rh factors and sis. id and dihybrid cross problems, nce, linkage, crossing over, and vze pedigrees, assess inheritance of	
5Credit Value1 Credit1 credit =30 Hours – Learning and Observation6Total MarksMaximum Marks :25Minimum Passing Marks:10PART B: CONTENT OF THE COURSES. No.List of Experiments1Preparation of pre-treating / fixing agents/ stains for cytological studies.2Study of Mitosis using root tips.3Study of Meiosis using flower buds.4Preparation of salivary gland chromosomes in Chironomous larvae5Preparation of salivary gland chromosomes in Drosophila larvae6Blood typing in humans for multiple alleles and Rh factor7Genetic Problems on Monohybrid cross,							genetic counseling communication
6Total MarksMaximum Marks :25Minimum Passing Marks:10PART B: CONTENT OF THE COURSES. No.List of Experiments1Preparation of pre-treating / fixing agents/ stains for cytological studies.2Study of Mitosis using root tips.3Study of Meiosis using flower buds.4Preparation of salivary gland chromosomes in Chironomous larvae5Preparation of salivary gland chromosomes in Drosophila larvae6Blood typing in humans for multiple alleles and Rh factor7Genetic Problems on Monohybrid cross,	-		4 \$ 7 1				
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<ul> <li>2 Study of Mitosis using root tips.</li> <li>3 Study of Meiosis using flower buds.</li> <li>4 Preparation of salivary gland chromosomes in <i>Chironomous</i> larvae</li> <li>5 Preparation of salivary gland chromosomes in <i>Drosophila</i> larvae</li> <li>6 Blood typing in humans for multiple alleles and Rh factor</li> <li>7 Genetic Problems on Monohybrid cross,</li> </ul>	<b>S</b> . I			7		^	
<ul> <li>3 Study of Meiosis using flower buds.</li> <li>4 Preparation of salivary gland chromosomes in <i>Chironomous</i> larvae</li> <li>5 Preparation of salivary gland chromosomes in <i>Drosophila</i> larvae</li> <li>6 Blood typing in humans for multiple alleles and Rh factor</li> <li>7 Genetic Problems on Monohybrid cross,</li> </ul>		1	Preparation	of pre-tre	eating / fixi	ng agents/ stains for cy	tological studies.
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<ul> <li>5 Preparation of salivary gland chromosomes in <i>Drosophila</i> larvae</li> <li>6 Blood typing in humans for multiple alleles and Rh factor</li> <li>7 Genetic Problems on Monohybrid cross,</li> </ul>		3	Study of Meiosis using flower buds.				· · · · · · · · · · · · · · · · · · ·
6     Blood typing in humans for multiple alleles and Rh factor       7     Genetic Problems on Monohybrid cross,	4		Preparation of salivary gland chromosomes in Chironomous larvae				
7 Genetic Problems on Monohybrid cross,	5 P		Preparation	of saliva	ry gland chi	romosomes in Drosoph	nila larvae
		6	Blood typing				
9 Constie Brokland en Dileiteiten	_	7	Genetic Prob	olems on	Monohybr	id cross,	
8 Genetic Problems on Dihybrid cross		8	Genetic Prob	olems on	Dihybrid c	ross	

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9	Genetic Problems Non-Mendelian Interactions.
10	Problems on Linkage and crossing over.
11	Problems based on construction of genetic map.
12	Hemoglobin electrophoresis (paper electrophoresis)
13	Scoring dysmorphic features in syndromic patients
14	Construction and analysis of Pedigree
15	Assessment of inheritance of quantitative characters
16	To study the communication process of Genetic counselling for genetic testing.

S. No.	Category	Name of Nominated Members	Signature
15.	Chairperson	Dr. Ranjana Shrivastava	
16.	Members	1. Dr. G. S. Thakur	0
		2. Dr. Shriram Kunjam	Conjon.
		3. Dr. Satish Kumar Sen	8
		4. Dr. Vijay Laxmi Naidu	stas
		5. Mr. Motiram Sahu	No 24
		6. Dr. Rajeshwari Prabha Lahare	d
17.	Subject specialist	1. Prof. P.C. Panda Retd. Professor Borsi Durg C.G.)	2
		2. Dr. N.B. Singh (Govt. N. PG. Science College Raipur C.G.)	WB
18.	VC Nominated member	Dr. Aruna Shrivastava (Govt. D.B. Girls PG College Raipur C.G.)	B
19.	Corporate/ Industrial area Representative	Shri Manish Jain (Apollo College, Durg C.G.)	erwat
20.	Ex Meritorious Student PG	Tanu Verma	Tverma.
21.	Subject expert from other Department	Dr. Divya Minz (Department of Zoology, Govt. V.Y.T. PG. Autonomous College Durg C.G.)	Pij

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#### PART C - LEARNING RESOURCES

#### Text Books, Reference Books, Other Resources

#### **TEXT BOOKS Recommended:**

- Principles of Genetics, D. P. Snustad and M. J. Simmons, 2008, John Wiley & Sons.
- Concepts of Genetics (10th ed.), W. S. Klug, M. R. Cummings, C. Spencer, and M. A. Palladino, 2020, Pearson.
- Genetics: Analysis & Principles (7th ed.), R. J. Brooker, 2015, McGraw-Hill.
- Genetic Analysis: An Integrated Approach (2nd ed.), M. F. Sanders and J. L. Bowman, 2014, Pearson.
- Molecular Cell Biology (6th ed.), H. Lodish, A. Berk, C. A. Kaiser, M. Krieger, A. Bretscher, H. Ploegh, A. Amon, and M. P. Scott, 2008, Macmillan.

#### **Reference Books:**

- Cytogenetics, P. K. Gupta, 2010, Rastogi Publications.
- Modern Microbial Genetics, U. N. Streips and R. E. Yasbin (Eds.), 2004, John Wiley & Sons.
- Fundamental Bacterial Genetics, N. Trun and J. Trempy, 2009, John Wiley & Sons.

#### Online Resources: ( e- Resources/ e- Books/ e- Learning Portals)

 https://epgp.inflibnet.ac.in/

 PART D: ASSESSMENT AND EVALUATION

 Suggested Continuous Evaluation Methods:

 Maximum Marks:
 25 Marks

 (Will include Internal assessment, Lab records and End Semester Viva/Voce and performance)

 Semester End
 Laboratory performance: As per Dept. (LOCF)

 Exam (SEE)

S. No.	Category	Name of Nominated Members	Signature
22,	Chairperson	Dr. Ranjana Shrivastava	
23.	Members	1. Dr. G. S. Thakur	Â
		2. Dr. Shriram Kunjam	Egistion,
		3. Dr. Satish Kumar Sen	S
		4. Dr. Vijay Laxmi Naidu	Mon
		5. Mr. Motiram Sahu	Not Ed

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Mr. A

		6. Dr. Rajeshwari Prabha Lahare	
24.	Subject specialist	1. Prof. P.C. Panda Retd. Professor Borsi Durg C.G.)	2
		2. Dr. N.B. Singh (Govt. N. PG. Science College Raipur C.G.)	plas
25.	VC Nominated member	Dr. Aruna Shrivastava (Govt. D.B. Girls PG College Raipur C.G.)	Re
26.	Corporate/ Industrial area Representative	Shri Manish Jain (Apollo College, Durg C.G.)	eulust
27.	Ex Meritorious Student PG	Tanu Verma	Tresma
28.	Subject expert from other Department	Dr. Divya Minz (Department of Zoology, Govt. V.Y.T. PG. Autonomous College Durg C.G.)	Øż

# FOUR YEAR UNDERGRADUATE PROGRAM SEMESTER V& VI SESSION 2024-25

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# GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG FOUR YEAR UNDERGRADUATE PROGRAM DEPARTMENT OF BOTANY COURSE CURRICULUM 2024-25

	Course Code Course Title Course Type Course Learning Outcome (CLO)		in genetic			
3 4 0	Course Type Course Learning	DSE This Course will enable the students to: • Students will demonstrate the use of molecular tools	in geneti			
4 (	Course Learning	<ul> <li>This Course will enable the students to:</li> <li>Students will demonstrate the use of molecular tools</li> </ul>	in geneti			
	Course Learning	• Students will demonstrate the use of molecular tools	in geneti			
2.8						
5	Credit Value	3 Credits 1 credit =15 Hours – Learning and Observation	on			
6						
PARTB	B: CONTENT OF					
	Total no. of	Teaching/ Learning Periods = 45 Periods (45 Hours)				
Unit	Topics (COURSE CONTENTS)					
	Genetic engineering Overview, Molecular Tools; DNA polymerase, Nucleases, Restriction Endonuclease, End modification enzymes, DNA ligases. Primers, linkers and adaptors. Vectors; Properties, Types (Plasmid, Cosmid, Phagemid, M13 vector, Shuttle vector, YAC, BAC, Bacteriophage vector), Cloning vs Expression vectors. Transformation Techniques; Introduction of DNA into host cells (in Plant and Bacterial cell), Natural gene Transfer method, Vector Mediated Method, Vectorless method Chemical and					
	<ul> <li>physical method.</li> <li>Screening and Selection of Recombinant Clone: Selectable and screenable marker. Selection of transformed bacterial cells, beta galactosidase gene complementation, Blue-white screening, Recombinant screening; Insertional inactivation, Red-white selection. cDNA Library and Genomic Library: General concept and components, construction and screening of libraries; colony and plaque hybridization, Application. Polymerase Chain Reaction:</li> </ul>					
III	DNA Sequencing: Sequencing enzyme	eral process, Types and applications. Chain termination method, Automated sequencing, e, Chemical degradation method, Pyrosequencing method. Juencing technology. Site Directed Mutagenesis: Non-PCR	10			

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1	based; Cassette mutagenesis, Primer extension mutagenesis, PCR Based; Overlap extension method, Megaprimer PCR, Inverse PCR, Application.	
	Genome Mapping; Genetic marker, Types of DNA Marker; RFLP, RAPD,	
	AFLP, Physical mapping; Restriction mapping.	
IV	Gene Silencing: mechanisms of Gene Silencing, Transcriptional Gene	10
	Silencing (TGS), Post-Transcriptional Gene Silencing (PTGS), RNA	
	Interference (RNAi), siRNA and miRNA, Applications of Gene Silencing	
	(Antisense oligonucleotides, Ribozymes). DNA Microarray: Types of DNA	
	Microarrays, Mechanisms and Applications of DNA Microarrays. DNA	
	fingerprinting.	
<b>X</b> 7		10
V	Electrophoretic mobility Shift Assay, Foot printing assay, Phage Display,	10
	Yeast two-hybrid assay, Transcript analysis and their applications.	
	CRISPR/Cas System: General Mechanism. Types of CRISPR/Cas9 System,	
	CRSIPR/Cas9 and targeted genome editing, Regulation for CRISPR/cas-9	
	technology, Applications of CRISPR/Cas System.	

S. No.	Category	Name of Nominated Members	Signature
1.	Chairperson	Dr. Ranjana Shrivastava	
		1. Dr. G. S. Thakur	R
		2. Dr. Shriram Kunjam	Com-
		3. Dr. Satish Kumar Sen	Si
		4. Dr. Vijay Laxmi Naidu	Mon
		5. Mr. Motiram Sahu	plan
	<i>N</i>	6. Dr. Rajeshwari Prabha Lahare	Det
2.	Subject specialist	1. Prof. P.C. Panda Retd. Professor Borsi Durg C.G.)	X
		2. Dr. N.B. Singh (Govt. N.PG. Science College Raipur C.G.)	May
3.	VC Nominated member	Dr. Aruna Shrivastava (Govt. D.B. Girls PG College Raipur C.G.)	Ash
4.	Corporate/ Industrial area Representative	Shri Manish Jain (Apollo College, Durg C.G.)	-eugt.
5.	Ex Meritorious Student PG	Tanu Verma	Thorma
6.	Subject expert from other Department	Dr. Divya Minz (Department of Zoology, Govt. V.Y.T. PG Autonomous College Durg C.G.)	Pij

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#### PART C - LEARNING RESOURCES

#### Text Books, Reference Books, Other Resources

#### **TEXT BOOKS Recommended:**

- Green, M. R., & Sambrook, J. (2012). Molecular cloning: A laboratory manual (4th ed.). Cold Spring Harbor Laboratory Press.
- Primrose, S. B., & Twyman, R. (2006). Principles of gene manipulation and genomics\* (7th ed.). Wiley-Blackwell.
- Setlow, J. K. (Ed.). (2001). Genetic engineering: Principles and methods (Vol. 23). Springer.
- Brown, T. A. (2016). Gene cloning and DNA analysis: An introduction (7th ed.). Wiley-Blackwell.
- Watson, J. D., Caudy, A. A., Myers, R. M., & Witkowski, J. A. (2007). Recombinant DNA: Genes and genomes A short course (3rd ed.). W.H. Freeman and Company.

#### **Online Resources: (e- Resources/ e- Books/ e- Learning Portals**

https://epgp.inflibnet.ac.in/

PART D: ASSES	SSMENT AND EVALUATION			
Suggested Conti	nuous Evaluation Methods:			
Maximum Marl	<b>CS:</b>	75 Marks		
<b>Continuous Con</b>	nprehensive Evaluation (CCE):	15 Marks		
Semester End Exam (SEE):		60 Marks		
Internal Assessment:		Internal Test of 15 Marks and Assignment of 15 Marks		
Continuous Comp	rehensive Evaluation (CCE)			
Semester End	Pattern -FOUR Questions (A, I			
Exam (SEE)			02 x 5 = 10 Marks	
Question - C: Short answer type			03 x 5 = 15 Marks	
	Question - D: Long answer type	question	07 x 5 = 35 Marks	
		Total	= 60 Marks	

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S. No.	Category	Name of Nominated Members	Signature
1.	Chairperson	Dr. Ranjana Shrivastava	
		1. Dr. G. S. Thakur	Q
		2. Dr. Shriram Kunjam	Como
		3. Dr. Satish Kumar Sen	8
		4. Dr. Vijay Laxmi Naidu	Vita
		5. Mr. Motiram Sahu	the
		6. Dr. Rajeshwari Prabha Lahare	
2.	Subject specialist	1. Prof. P.C. Panda Retd. Professor Borsi Durg C.G.)	il a
		2. Dr. N.B. Singh (Govt. N.PG. Science College Raipur C.G.)	Um
3.	VC Nominated member	Dr. Aruna Shrivastava (Govt. D.B. Girls PG College Raipur C.G.)	A
4.	Corporate/ Industrial area Representative	Shri Manish Jain (Apollo College, Durg C.G.)	eurity (
5.	Ex Meritorious Student PG	Tanu Verma	Tvenng.
6.	Subject expert from other Department	Dr. Divya Minz (Department of Zoology, Govt. V.Y.T. PG Autonomous College Durg C.G.)	Ding

## GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG FOUR YEAR UNDERGRADUATE PROGRAM DEPARTMENT OF BOTANY COURSE CURRICULUM 2024-25

#### Lab Course

	Program:	Class: B.Sc.	Semester -V	Session: 2024-2025		
1	Course Code					
2 Course Title Genetic Engineering						
3	<b>Course Type</b>	DSE				
4	Course	This Course will ena	ble the students to	•		
	Learning Outcome (CLO)	engineering and reco	ombinant DNA tech	0,		
			trophoresis, PCR	r biology techniques such as DNA (Polymerase Chain Reaction), and		
		• Ability to utilize bio	oinformatics tools f	asmid DNA from various organisms. For sequence analysis, primer design,		
		and the interpretation	n of genetic data.			
		Awareness of safe guidelines associated		cal considerations, and regulatory neering research.		
5         Credit Value         1 Credit         1 credit         30 Hours – Learning and Observation						
6	Total Marks	Maximum Marks :25		Minimum Passing Marks:10		
PA		T OF THE COURSE		8		
		<b>kperiments</b>				
1		of Genomic DNA				
2	Isolation of	of plasmid DNA.				
3		tion map of plasmid DNA.				
4	Restriction	n mapping of Bacterial genomic DNA				
5		er printing.				
6	PCR base	d experiment. (AFLP, RAI	PD)			
7	Ligation c					
8		ression in <i>E. coil</i> and analy	vsis of gene product			
9	DNA end					
10		Random primer labeling				
11	Gene amp	lification and Cloning of a	amplified product	1		
			RA	1 Atra		

. No.	Category	Name of Nominated Members	Signature
1.	Chairperson	Dr. Ranjana Shrivastava	
	<i>V</i>	1. Dr. G. S. Thakur	A
		2. Dr. Shriram Kunjam	apir
		3. Dr. Satish Kumar Sen	on
		4. Dr. Vijay Laxmi Naidu	XHOS
	_	5. Mr. Motiram Sahu	Way
		6. Dr. Rajeshwari Prabha Lahare	0 /
2.	Subject specialist	1. Prof. P.C. Panda Retd. Professor Borsi Durg C.G.)	Y
		2. Dr. N.B. Singh (Govt. N.PG. Science College Raipur C.G.)	MA
3.	VC Nominated member	Dr. Aruna Shrivastava (Govt. D.B. Girls PG College Raipur C.G.)	Ath
4.	Corporate/ Industrial area Representative	Shri Manish Jain (Apollo College, Durg C.G.)	-onth
5.	Ex Meritorious Student PG	Tanu Verma	Tverma
6.	Subject expert from other Department	Dr. Divya Minz (Department of Zoology, Govt. V.Y.T. PG Autonomous College Durg C.G.)	Quin

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#### **PART C - LEARNING RESOURCES**

#### Text Books, Reference Books, Other Resources

#### **TEXT BOOKS Recommended:**

- Green, M. R., & Sambrook, J. (2012). Molecular cloning: A laboratory manual (4th ed.). Cold Spring Harbor Laboratory Press.
- Daniel L. Hartl & Elizabeth W. Jones : Genetics analysis of Genes & Genomes .
- Benjamin A. Pierce : genetics a conceptual approach
- D. Peter Snustad & Michael J. Simmons : Principles of Genetics
- Tom Strachan & Andrew P. Read : Human Molecular Genetics

#### **Online Resources: ( e- Resources/ e- Books/ e- Learning Portals)**

https://epgp.inflibnet.ac.in/

# PART D: ASSESSMENT AND EVALUATION Suggested Continuous Evaluation Methods: Maximum Marks: 25 Marks (Will include Internal assessment, Lab records and End Semester Viva/Voce and performance) Semester End Laboratory performance: As per Dept. (LOCF) Exam (SEE)

S. No.	Category	Name of Nominated Members	Signature
1.	Chairperson	Dr. Ranjana Shrivastava	
		1. Dr. G. S. Thakur	
		2. Dr. Shriram Kunjam	Copyon,
		3. Dr. Satish Kumar Sen	Sm
		4. Dr. Vijay Laxmi Naidu	Mas
		5. Mr. Motiram Sahu	whe
		6. Dr. Rajeshwari Prabha Lahare	XI
2.	Subject specialist	1. Prof. P.C. Panda Retd. Professor Borsi Durg C.G.)	20
		2. Dr. N.B. Singh (Govt. N.PG. Science College Raipur C.G.)	Wa
3.	VC Nominated member	Dr. Aruna Shrivastava (Govt. D.B. Girls PG College Raipur C.G.)	At
4.	Corporate/ Industrial area Representative	Shri Manish Jain (Apollo College, Durg C.G.)	eug).
5.	Ex Meritorious Student PG	Tanu Verma	Themas
6.	Subject expert from other Department	Dr. Divya Minz (Department of Zoology, Govt. V.Y.T. PG Autonomous College Durg C.G.)	Piz

# GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG FOUR YEAR UNDERGRADUATE PROGRAM DEPARTMENT OF BOTANY

#### COURSE CURRICULUM 2024-25

PAR	TA: INTRODUCT	ION				
	Program:	Class:	B.Sc.	Semester -VI	Session:2024-	-2025
1.	Course Code					
2.	Course Title	Plant Pathology and Integrated Plant Disease Management				
3.	Course Type	DSE				
4.	Course Learning	This (		enable the students to:		
	Outcome (CLO)	0	inoculation microorgan Acquired k loss and dis Help the le field, their agents by n Help the le their interact	hisms and handling of different mowledge may help the study sease management through variations for identify the disease proper management as well a hicroscopic study. arners for proper understating ction with host which in turn a	on, maintena nt instruments. dents for predic arious approache ses through syn as identification g of pathogen b	nce of cting crop es. nptoms in of causal wehaviour,
5.	Cuedit Velue	3 Cre	resistant cu			
5. 6.	Credit Value Total Marks			1 credit =15 Hours – 1		
	Γ B: CONTENT OF		im Marks :	/5 Mir	imum Passing N	Aarks:30
IAN				ing Doute de - 45 Deute de (4)		
		JI Teach	mg/ Learn	ing Periods = 45 Periods (45	5 Hours)	N. C
Unit				RSE CONTENTS)		No. of Periods
I	History of Plant Pa concepts in Plant P agents (Fungi, Bacte	athology athology ria, Viru	with spec Classifications, Nemator		k. Terms and ding to causal	10
п	Disease Symptoms, biotic and abiotic causes of plant diseases, survival and dispersal of important plant pathogens, Host parasite interaction, recognition of host by pathogens, concept of infection, entry of pathogen into host, mode of host penetration, appressorium, infection peg, symptomatology, inoculums; Defense strategies- Physical and biochemical (preformed and post inflectional). ISR and SAR.					
III	biotroph and necrotr to isolate pathogens.	oph path Preserva	ogens, pure tion of plan	s: Methods to prove Koch's p culture techniques, use of so t pathogens and disease spec chniques for detection of pla	elective media imens, disease	10

IV	Principles of plant disease management by cultural, physical, biological, chemical, organic amendments and botanicals methods of plant disease control, integrated control measures of plant diseases. Disease resistance and molecular approach for disease management. Genetics for disease resistance – R genes, vertical and horizontal resistance.	10
V	History of fungicides, bactericides, concepts of pathogen immobilization, chemical protection and chemotherapy, nature, properties and mode of action of antifungal, antibacterial and antiviral chemicals.	10

Name &	Signature of Members of Boa	ard of Studios
	Signature of intempers of Do	at a of Studies

S. No.	Category	Name of Nominated Members	Signature
1.	Chairperson	Dr. Ranjana Shrivastava	8
		1. Dr. G. S. Thakur	A
		2. Dr. Shriram Kunjam	Cosm
		3. Dr. Satish Kumar Sen	So
		4. Dr. Vijay Laxmi Naidu	vita.
		5. Mr. Motiram Sahu	W/Let
_		6. Dr. Rajeshwari Prabha Lahare	
2.	Subject specialist	1. Prof. P.C. Panda Retd. Professor Borsi Durg C.G.)	172
		2. Dr. N.B. Singh (Govt. N.PG. Science College Raipur C.G.)	WR
3,	VC Nominated member	Dr. Aruna Shrivastava (Govt. D.B. Girls PG College Raipur C.G.)	ph
4.	Corporate/ Industrial area Representative	Shri Manish Jain (Apollo College, Durg C.G.)	evert.
5.	Ex Meritorious Student PG	Tanu Verma	Tverma.
6.	Subject expert from other Department	Dr. Divya Minz (Department of Zoology, Govt. V.Y.T. PG Autonomous College Durg C.G.)	Dig

#### PART C - LEARNING RESOURCES

#### Text Books, Reference Books, Other Resources

#### **TEXT BOOKS Recommended:**

#### **Reference Books:**

- 1. Pathak, V. N. Essentials of Plant Pathology. Prakash Pub., Jaipur
- 2. Mehrotra RS & Aggarwal A. 2007. Plant Pathology. 7th Ed. Tata McGraw Hill Publ. Co. Ltd.
- 3. Agrios, GN. 2010. Plant Pathology. Acad. Press.
- 4. Kamat, M. N. Introductory Plant Pathology. Prakash Pub, Jaipur
- 5. Singh RS. 2008. Plant Diseases.8th Ed. Oxford & IBH. Pub. Co.
- 6. Singh RS. 2013. Introduction to Principles of Plant Pathology. Oxford and IBH Pub. Co.
- Nene YL & Thapliyal PN. 1993. Fungicides in Plant Disease Control. 3rd Ed. Oxford & IBH, New Delhi. Vyas SC. 1993. Handbook of Systemic Fungicides. Vols. I-III. Tata McGraw Hill, New Delhi.
- Rhower GG. 1991. Regulatory Plant Pest Management. In: Handbook of Pest Management in Agriculture. 2nd Ed. Vol. II. (Ed. David Pimental). CRC Press. 17) Singh RS & Sitaramaiah K. 1994. Plant Pathogens – Nematodes. Oxford & IBH, New Delhi.
- 9. Thorne G. 1961. Principles of Nematology. McGraw Hill, New Delhi.
- 10. Gibbs A & Harrison B. 1976. Plant Virology The Principles. Edward Arnold, London.

#### Online Resources: (e- Resources/ e- Books/ e- Learning Portals

e-PG PATHSHALA - https://epgp.inflibnet.ac.in/

PART D: AS	SSESSMENT AND EVALUATI	ON		
Suggested C	ontinuous Evaluation Methods:			
Maximum N	Aarks:	75 Marks		
Continuous	<b>Comprehensive Evaluation (CC</b>	E): 15 Marks		
Semester Er	nd Exam (SEE):	60 Marks		
Internal Ass	sessment:	Internal Test of 15 Marks and Assignment of 15 Marks		
Continuous Co	omprehensive Evaluation (CCE)			
Semester	Pattern -FOUR Questions (A, I	B, C, D) from each Unit		
End Exam	Question - A & B: (Compulsory)	Very short answer type (01 each)	02 x 5 = 10 Marks	
(SEE) Question - C: Short answer type		question	$03 \ge 5 = 15$ Marks	
	Question - D: Long answer type	question	07 x 5 = 35 Marks	
		Total	= 60 Marks	

S. No.	Category	Name of Nominated Members	Signature
1.	Chairperson	Dr. Ranjana Shrivastava	
		1. Dr. G. S. Thakur	0
		2. Dr. Shriram Kunjam	Chim-
		3. Dr. Satish Kumar Sen	Sis
		4. Dr. Vijay Laxmi Naidu	VIT'S
		5. Mr. Motiram Sahu	alter
		6. Dr. Rajeshwari Prabha Lahare	A.
2.	Subject specialist	1. Prof. P.C. Panda Retd. Professor Borsi Durg C.G.)	Va
		2. Dr. N.B. Singh (Govt. N.PG. Science College Raipur C.G.)	W.B.
3.	VC Nominated member	Dr. Aruna Shrivastava (Govt. D.B. Girls PG College Raipur C.G.)	ANZ.
4.	Corporate/	Shri Manish Jain (Apollo College, Durg C.G.)	
	Industrial area		and
	Representative		
5.	Ex Meritorious	Tanu Verma	V'I
	Student PG		Stear
6.	Subject expert from	Dr. Divya Minz (Department of Zoology, Govt. V.Y.T. PG	0.1
Ť.	other Department	Autonomous College Durg C.G.)	6157

# GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG FOUR YEAR UNDERGRADUATE PROGRAM DEPARTMENT OF BOTANY COURSE CURRICULUM 2024-25

# Lab Course

	Date		TION		
		gram:	Class: B.Sc.	Semester -VI	Session:2024-2025
1	Course Code				4
2		se Title		y and Integrated Plant I	Disease Management
3		se Туре	DSE		
4	4 Course Learning Outcome (CLO)		<ul> <li>Identify and viruses, and</li> <li>Utilize micro plant pathog</li> <li>Apply princ biological, and</li> <li>Integrate known</li> </ul>	nematodes through observoscopy and molecular too ens. iples of integrated diseas nd chemical control metho	diseases caused by fungi, bacteria, vation and laboratory techniques. Is for the accurate identification of e management, including cultural.
5	Cred	it Value	1 Credit		urs – Learning and Observation
5	Tota	l Marks	Maximum Mar		Minimum Passing Marks:10
PA	RT B:	CONTENT	OF THE COURS	SE	
S. No.				List of Experiment	S
	1 Study of sym		nptoms of various	s plant diseases.	
	2	Preparation	of media, isolation	n and Koch's postulates.	
	3	Staining and	identification of	plant pathogenic bacteria.	
	4	Mode of tran	smission of plant	viruses	
	5	Study of mor	rphological featur	es and identification of pl	ant parasitic nematodes.
	6	Preservation	of plant pathoger	as and disease specimens.	
	7	Extraction of nematodes from soil.			
1	Acquaintance with different formulations and preparation of certain homemade fungionand botanicals etc.			on of certain homemade fungicide	

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S. No.	Category	Name of Nominated Members	Signature
1,	Chairperson	Dr. Ranjana Shrivastava	g
		1. Dr. G. S. Thakur	A
		2. Dr. Shriram Kunjam	Caston
		3. Dr. Satish Kumar Sen	SN
		4. Dr. Vijay Laxmi Naidu	14fai
		5. Mr. Motiram Sahu	As
		6. Dr. Rajeshwari Prabha Lahare	A
2.	Subject specialist	1. Prof. P.C. Panda Retd. Professor Borsi Durg C.G.)	20
		2. Dr. N.B. Singh (Govt. N.PG. Science College Raipur C.G.)	les
3.	VC Nominated member	Dr. Aruna Shrivastava (Govt. D.B. Girls PG College Raipur C.G.)	102
4.	Corporate/	Shri Manish Jain (Apollo College, Durg C.G.)	1
	Industrial area		Ala
	Representative		Child.
5.	Ex Meritorious	Tanu Verma	
	Student PG		Werner.
6.	Subject expert from	Dr. Divya Minz (Department of Zoology, Govt. V.Y.T. PG	
	other Department	Autonomous College Durg C.G.)	477

#### Text Books, Reference Books, Other Resources

#### **TEXT BOOKS Recommended:**

Singh RS. 1982. Plant Pathogens ñ The Fungi. Oxford & IBH, New Delhi.

Noordam D. 1973. Identification of Plant Viruses, Methods and Experiments. Oxford & IBH, New Delhi.

Bos L. 1964. Symptoms of Virus Diseases in Plants. Oxford & IBH., New Delhi.

Verma JP, Varma A & Kumar D. (Eds). 1995. Detection of Plant Pathogens and their Management. Angkor Publ., New Delhi.

Singh DP & Singh A. 2007. Disease and Insect Resistance in Plants. Oxford & IBH, New Delhi.

Online Resources: ( e- Resources/ e- Books/ e- Learning Portals)

https://epgp.inflibnet.ac.in/

#### PART D: ASSESSMENT AND EVALUATION

**Suggested Continuous Evaluation Methods:** 

Maximum Marks:

25 Marks

(Will include Internal assessment, Lab records and End Semester Viva/Voce and performance)

Semester End Exam (SEE)	Laboratory performance: As per Dept. (LOCF)
<b>``</b>	

S. No.	Category	Name of Nominated Members	Signature
1.	Chairperson	Dr. Ranjana Shrivastava	
		1. Dr. G. S. Thakur	
		2. Dr. Shriram Kunjam	Kopson
		3. Dr. Satish Kumar Sen	83
		4. Dr. Vijay Laxmi Naidu	VAS
		5. Mr. Motiram Sahu	where
		6. Dr. Rajeshwari Prabha Lahare	
2.	Subject specialist	1. Prof. P.C. Panda Retd. Professor Borsi Durg C.G.)	1º
		2. Dr. N.B. Singh (Govt. N.PG. Science College Raipur C.G.)	Me

3.	VC Nominated	Dr. Aruna Shrivastava (Govt. D.B. Girls PG College Raipur	A a
	member	C.G.)	Ash
4,	Corporate/	Shri Manish Jain (Apollo College, Durg C.G.)	202
	Industrial area		anna
	Representative		CON DX
5.	Ex Meritorious	Tanu Verma	tesma
	Student PG		Avea
6.	Subject expert from	Dr. Divya Minz (Department of Zoology, Govt. V.Y.T. PG	74
	other Department	Autonomous College Durg C.G.)	but
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