

Scheme of B.Sc. Botany

Year	Course Code	Subject Name	Theory/ Practical	Total Credit	Total Marks	
					Max	Min
First year	BOT-1T	Microbial Diversity and Plant Pathology	Theory	4	50	17
	BOT--2T	Archegoniateae and Plant Architecture	Theory	4	50	17
	BOT--1P	LAB 1 : Microbial Techniques and Archegoniate identification	Practical	2	50	17
Second year	BOT--3T	Plant Systematics, Economic Botany and Ethnobotany	Theory	4	50	17
	BOT--4T	Plant Anatomy, Embryology and Plant Breeding	Theory	4	50	17
	BOT--2P	LAB 2 : Plant Identification and Embryology	Practical	2	50	17
Third year	BOT -5T	Plant Physiology and Ecology	Theory	4	50	17
	BOT -6T	Cytogenetics, plant tissue culture and biometry	Theory	4	50	17
	BOT -3P	LAB 3 : Experiments in Physiology, Biochemistry & Molecular biology	Practical	2	50	17

Note: There shall be four extra credits in each year for internship/apprenticeship. The certificate of extra credits for this would be provided by the concern university and it is not mandatory.

Part A : Introduction			
Programme: Certificate		Class B.Sc.-III	Year: 2022
		Session: 2022-23	
1.	Course Code	BOT-3P	
2.	Course Title	Experiments in physiology, Biochemistry & molecular biology	
3.	Course Type	Practical	
4.	Pre-requisite (if any)	No	
5.	Course outcomes:	<ul style="list-style-type: none"> • Course outcomes: • After the completion of the course the students will be able to: • Know and authentic the physiological processes undergoing in plants along with • their metabolism • Identify Mineral deficiencies based on visual symptoms • Understand and develop skill for conducting molecular experiments for genetic • engineering 	
6.	Credit Value	2	
7.	Total Marks	Max. Marks: 50	Min. Passing Marks:17
Part B : Content of the Course			
Total No. of Periods - 30			
Tentative Practical List	Topic* *(Topic * (Minimum Any three from each unit depending on facilities and syllabus. 20% for spotting, 10% each for viva and sessional and rest 60 % marks equally in each unit.))		
	Plant water relation, Mineral Nutrition and translocation in phloem <ol style="list-style-type: none"> 1. Determination of osmotic potential of plant cell sap by plasmolytic method using leaves of <i>Rhoeo</i> / <i>Tradescantia</i>. 2. Osmosis – by potato osmoscope experiment 3. Effect of temperature on absorption of water by storage tissue and determination of Q10. 4. Experiment to demonstrate the transpiration phenomenon with the bell jar method 5. Structure of stomata (dicot & monocot) 6. Experiment to measure the rate of transpiration by using Ganong's/s/ 		

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	<p>Farmer's potometer</p> <p>7. Study of mineral deficiency symptoms using plant material/photographs.</p> <p>Cell biology</p> <p>1. Study of plant cell structure with the help of epidermal peel mount of <i>Onion/Rhoeo/Crinum/ etc.</i></p> <p>2. Measurement of cell size by the technique of micrometry (Ocular and stage micrometer).</p> <p>3. Determination of mitotic index/ meiotic index and frequency of different mitotic / meiotic stages in pre-fixed root tips and flower buds respectively.</p>
	<p>Nitrogen Metabolism, Photosynthesis & Respiration : 1. A basic idea of chromatography: Principle, paper chromatography , column chromatography and TLC; demonstration of chromatography.</p> <p>2. Separation of photosynthetic pigments by paper chromatography.</p> <p>3. Effect of quality of light/concentration of Carbon dioxide on photosynthetic rate in aquatic plant</p> <p>4. Determination of the RQ starchy/ proteinaceous/ oily germinating seeds.</p> <p>Genetics: 1. Monohybrid cross (Dominance, codominance and incomplete dominance)</p> <p>2. Dihybrid cross (Dominance and incomplete dominance)</p> <p>3. Gene interactions (All types of gene interactions mentioned in the syllabus)</p> <p>a. Recessive epistasis 9: 3: 1.</p> <p>b. Dominant epistasis 12: 3: 1</p> <p>c. Complementary genes 9: 7</p> <p>d. Duplicate genes with cumulative effect 9: 6: 1</p> <p>e. Inhibitory genes 13: 3</p> <p>4. Observe the genetic variations among inter and intra specific plants.</p> <p>5. Demonstration of Breeding techniques-Hybridization, emasculation/ bagging/ tagging experiment.</p>
	<p>Genetic material: 1. Instruments and equipments used in molecular biology.</p> <p>2. Isolation of DNA from plants</p>
	<p>Techniques for biochemical analysis: 1. Weighing and Preparation of solutions -percentage, molar & normal solutions, dilution from stock solution etc.</p> <p>2. Separation of amino acids by paper chromatography.</p> <p>3. Detection of organic acids: citric, tartaric, oxalic and malic from laboratory samples.,</p> <p>4. Qualitative Analysis of carbohydrates,</p> <p>5. Estimation of reducing sugar by anthrone method,</p> <p>6. Qualitative Analysis of Lipids</p> <p>7. Qualitative analysis of Amino acids and Proteins</p>
	<p>Biostatistics: 1. Univariate analysis of statistical data: Statistical tables, Central</p>

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	<p>tendency - mean, mode, median, standard deviation and standard error (using seedling population /leaflet size).</p> <p>2.Calculation of correlation coefficient values and finding out the probability.</p> <p>3.Determination of goodness of fit in Mendelian and modified mono-and dihybrid ratios (3:1, 1:1, 9:3:3:1, 1:1:1:1, 9:7, 13:3, 15:1) by Chi-square analysis and comment on the nature of inheritance.</p> <p>3. Computer application in biostatistics - MS Excel and SPSS</p>
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Part C - Learning Resource	
Text Books, Reference Books, Other Resources	
<p>Suggested Readings:</p> <ol style="list-style-type: none"> 1. A Laboratory Manual Of Plant, Physiology, Biochemistry And Ecology ISBN: 9788177544589 Edition: 01 Year: 2012 Author: Akhtar Inam Publisher : Agrobios (India). 2. Wilson and Walker. Practical Biochemistry: Principles and Techniques. Cambridge University Press. U.K. 3. Pandey S.K. (2012). Quick Concept of Botany. Publisher LAP LAMBERT Academic Publishing GmbH & Co. KG, Germany (ISBN: 978-3-8484-3104-5). 4. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley & Sons. Inc. <p>E-learning Resources:</p> <ol style="list-style-type: none"> 1. https://www.edx.org/learn/molecular-biology 2. https://krishikosh.egranth.ac.in/handle/1/5810039999 3. https://www.classcentral.com/course/swayam-genetic-engineering-theory-and-application-14090 4. https://www.coursera.org/courses?query=genetics 5. https://www.coursera.org/courses?query=molecular%20biology 6. https://www.edx.org/learn/genetic-engineering 7. https://www.mooc-list.com/tags/genetic-engineering 8. https://www.classcentral.com/course/edx-molecular-biology-part-1-dna-replication-and-repair-2907 	

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Part D – Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50

Continuous Comprehensive Evaluation (CCE): Not Applicable

University Exam(UE): 50 Marks

Internal Assessment:

Continuous Comprehensive
Evaluation (CCE)




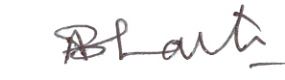
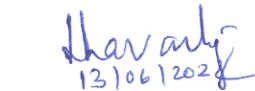
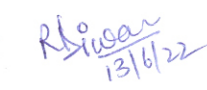



Class Test/Assignment/Presentation


Not Applicable

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Declaration

This is to certify that the syllabus is framed by the Central Board of Studies (Botany) as per the guidelines (TOR) of the Department of Higher Education, Raipur Chhattisgarh.

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Part A: Introduction			
Program: B.Sc.		Class: B.Sc. III Year	Year: 2024 Session: 2024-2025
1.	Course Code	BOT-5T	
2.	Course Title	Plant Physiology and Ecology	
3.	Course Type	Theory	
4.	Pre-requisite (if any)	NO	
5.	Course Learning Outcomes (CLO)	After the completion of the course the students will be able to: <ol style="list-style-type: none"> 1. Understand the role of Physiological and metabolic processes for plant growth and development. 2. Learn the symptoms of Mineral Deficiency in crops and their management. 3. Assimilate Knowledge about Biochemical constitution of plant diversity 4. acquaint the students with complex interrelationship between organisms and environment; 5. make them understand methods for studying vegetation, community patterns and processes, ecosystem functions, and principles of phytogeography. 6. This knowledge is critical in evolving strategies for sustainable natural resource management and biodiversity conservation. 	
6.	Credit Value	Theory: 4	
7.	Total Marks	Max. Marks: 50	Min Passing Marks: 17

Part B: Content of the Course		
Total Periods: 60		
Unit	Topics	No. of Period
I	Plant water relation, Mineral Nutrition, Transpiration and translocation in phloem: Importance of water, water potential and its components; Osmosis, Diffusion, Diffusion Pressure Deficit, Plasmolysis, Imbibition, Mechanism of water absorption, Transpiration and its significance; Factors affecting transpiration; Root pressure and guttation. Criteria of essentiality of elements; Role of essential elements- micro and macro elements; Symptoms of mineral deficiency in major crops, Minerals absorption and their transport across the cell membrane, Ascent of sap, Phloem transport	12
II	Carbon metabolism: Enzymes: Structure of enzyme: holoenzyme, apoenzyme, cofactors, coenzymes and prosthetic group; mechanism of action (activation energy, lock and key hypothesis, induced- fit theory), enzyme inhibition and factors affecting enzyme activity, Allosteric enzymes & Abzymes. Photosynthesis: structure of chloroplast, Pigments, Absorption and Action spectra, Emerson's Enhancement effect, Photosystems, Electron transport system (Z-Scheme) and Photophosphorylation, Carbon fixation- the Calvin cycle, Photorespiration, C4 and CAM cycle. Respiration -structure of mitochondria, aerobic and anaerobic respiration and fermentation, glycolysis, Krebs cycle, and electron transport system, ATP-synthase, RQ, Factors affecting respiration, Pentose phosphate pathway	12

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III	<p>Nitrogen and Lipid Metabolism: Physical and biological nitrogen fixation (examples of legumes and non-legumes), Physiology and biochemistry of nitrogen fixation, Nitrate and ammonia assimilation, reductive amination and transamination, amino acid synthesis.</p> <p>Lipid Metabolism: Synthesis and breakdown of triglycerides, alpha and beta -oxidation, glyoxylate cycle, gluconeogenesis and its role in mobilization of lipids during seed germination</p> <p>Plant Development, Movements, Dormancy & Responses: Plant growth curve, developmental roles of phytohormones (auxins, gibberellins, cytokinins, ABA, ethylene), Photoperiodism (SDP, LDP, Day neutral plants); Phytochrome (discovery, structure and functions), Seed and bud Dormancy, Vernalization & Senescence, Plant movements</p>	12
IV	<p>Natural resources & Sustainable utilization; Ecology & Ecosystem: Definition of Ecology, Ecological Factors, Positive and negative interactions. Ecosystem– Concept of structure and function of an ecosystem- trophic levels, food chain, food web, Ecological pyramids</p> <p>Abiotic and biotic components, -Energy flow in an ecosystem</p> <p>Ecological Succession-Definition & types. Processes and types (autogenic, allogenic, autotrophic, heterotrophic, primary & secondary), Hydrosere and Xerosere.</p> <p>Ecological Adaptations – Hydrophytes, Xerophytes</p>	12
V	<p>Biodiversity: alpha, beta and gamma diversity, social, ethical and aesthetic values; hotspots of biodiversity, threats to biodiversity, biotic communities and populations and their characteristics and dynamics. Endemic and endangered species of plants in India. Ecological niche, ecotypes, Ecotone, ecological indicators.</p> <p>Conservation of Biodiversity: Ex-situ and in-situ conservation, Red data book, botanical gardens, National park, Sanctuaries, hot & hottest spots and Bioreserves.</p>	12
<p>Keywords: Mineral nutrition, Carbon assimilation, Nitrogen and lipid metabolism, Natural resource management, Ecological succession, biodiversity conservation</p>		

Part C -Learning Resources

Text Books, Reference Books, Other Resources

1. Plant Physiology and Biochemistry ISBN #:81-301-0035-5 Sunil D Purohit, K. Ahmed & Gotam K Kukda Edition: 2013 Pages: 368 + VIII Text Book (Hindi)
2. Hopkins, W.G. & Hiiner, N.P. Introduction to Plant Physiology (3rd ed.) 2004, John Wiley & Sons.
3. A Handbook On Mineral Nutrition And Diagnostic Techniques For Nutritional Disorders of Crops (pb) ISBN :9788177543377 Edition : 01 Year : 2011 Author : Pathmanabhan G, Vanangamudi M, Chandrasekaran CN, Sathyamoorthi K, Babu CR, Babu RC, Boopathi PN Publisher : Agrobios (India)
4. Jain, V.K. Fundamental of Plant Physiology (7th ed.) 2004. S. Chand and Company.
5. Salisbury, F.B. & Ross, C.W. Plant Physiology (4th ed.), 19992, Wadsoworth Publishing Company.
6. Panday, S.N. & Sinha, B.K. Plant Physiology (4th ed.), 2006, Vikas Publishing House Pvt. Ltd.
7. Mukherjee, S. & Ghosh, A. Plant Physiology (2nd ed.), 2005, New Central Book Agency.
8. Chaudhuri, D., Kar, D.K., and Halder, S.A. Handbook of Plant Biosynthetic Pthways 2008, New Central Book. Agencies.

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9. Voet, D. and Voet, J.G., Bio-Chemistry (3rd ed.), 2005, John Wiley & Sons.
10. Mathews, C.K., Van Holder, K.E. & Ahren, K.G. Bio-Chemistry (3rd ed.), 2000, Pearson Education.
11. Lehninger Principles of Biochemistry. Sixth Edition. 2013. David L. Nelson, Michael M. Cox. Freeman, Macmillan.
12. Srivastava, H.N. 2006. Pradeep's Botany Vol. V. Pradeep Publications, Jalandhar.
13. Verma, S.K. Plant Physiology and Biochemistry. S. Chand & Sons, New Delhi.
14. Buchanon, Gruissen and Jones. Plant Physiology & Biochemistry: Biochemistry and Molecular Biology of plants, 2000, I.K. International.
15. Chapman and Riss. Ecology: Principles and Applications, Latest Ed., Cambridge University Press
16. Shukla, R.S. & Chandel, P.S. Plant Ecology, Latest Ed., S. Chandel and Co.
17. Kumar, H.D. Modern Concept of Ecology, Latest Ed. Vikas Publishing House
18. Begon, M., Herper, J.L. and Townsend, C.R. Ecology- Individuals, Populations and Communities (3rd ed.), Oxford Blackwell Science
19. Verma, P.S. & Agarwal, U.K. Concept of Ecology, Latest Ed., S. Chand & Company
20. Odum, F.P. Fundamentals of Ecology, Latest Ed., Saunders
21. Sharma, P.D. Elements of Ecology, Latest Ed., Rastogi Publications
22. Ambasht, R.S. & Ambasht, N.K. A Text Book of Plant Ecology, Latest Ed., CBS Publication & Distributors
23. Mani, M.S. Bio-Geography of India, Latest Ed., Springer-Verlag.
24. Mackenzie et al. Ecology, Latest Ed., Viva Books.
25. Gurevitch, J. (et al.), The Ecology of plants, 2002, Sinauer Associates
26. . Kimar, U. & Asija, M.J. Bio-diversity: Principles & Conservation, 2005, Student Edition, Agrobios (India)
27. Krishnamurthy, K.V. An Advanced Text Book on Biodiversity, 2003, Oxford & IBH Publishing Co. Ltd.
28. Mitra, D., Guha, J.K., Chowdhury, S.K. Studies in Botany, Vol. II (7th ed.) Moulik Library.
29. Primack, R.B. Essentials of Conservation Biology, 1993, Sinauer Associates.
30. Lo, C.P. & Yeung, A.K.W. Concepts and Techniques of Geographic Information Systems, 2002, Printice-Hallof India.
31. Cain, Bowman, Hacker. Ecology. 2014. 3rd Ed. Sinauer Associates
32. Vasudevan, N. (2006). Essentials of Environmental Science. Narosa Publishing House, New Delhi.
33. Singh, J. S., Singh, S.P. and Gupta, S. (2006). Ecology, Environment and Resource Conservation. Anamaya Publications, New Delhi.
34. Rogers, P.P., Jalal, K.F. and Boyd, J.A. (2008). An Introduction to Sustainable Development. Prentice Hall of India Private Limited, New Delhi.
35. Abbasi, S. A. (1998). Environmental Pollution and its Control. Cogent International, Pondicherry.
36. Abbasi, S. A. and Ramasamy, E. V. (1999). Biotechnological Methods of Pollution Control. Universities Press (India) Limited, Hyderabad.
37. Peavy, H. S., Rowe, D. R. and Tchobanoglaus, G. (1985). Environmental Engineering, Mc Graw Hill Book Company, Singapore.
38. Rand, M. C., Greenberg, A. E. and Taras, M. J. (Ed.) (1995). Standard methods for the examination of water and wastewater: 19th edition, American Public Health association (APHA), Washington, D.C.
39. Scragg, A. (1999). Environmental Biotechnology, Addison Wesley Longman, Singapore.
40. Tchobanoglaus, G. (1988). Wastewater Engineering: Treatment, Disposal, Reuse. Tata Mc Graw Hill, New Delhi.
41. Aarve, V. P., William, A. W. and Debra, R. R. (2002). Solid waste engineering. Cengage reading, USA.
42. George, T., Hilary, T. and Samuel, A. V. (1993). Integrated solid Waste Management, Engineering Principles and Management Issues, Mc Graw Hills.

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43. George, T. and Frank, K. (2002). Handbook of solid waste management: (Second edition). Mc Graw Hills.
44. Kanthi, L. S. (2000). Basics of Solids and hazardous waste management Technologies. Prentice Hall.
45. Anonymous. 1997. National Gene Bank: Indian Heritage on Plant Genetic Resources (Booklet). National Bureau of Plant Genetic Resources, New York.
46. Gillespie, A. 2006. Climate Change, Ozone Depletion and Air Pollution: Legal Commentaries with Policy and Science Considerations. Martinus Nijhoff Publishers.
47. Hardy, J.T. 2003. Climate Change: Causes, Effects and Solutions. John Wiley & Sons.
48. Harvey, D. 2000. Climate and Global Climate Change. Prentice Hall.
49. Manahan, S.E. 2010. Environmental Chemistry. CRC Press, Taylor and Francis Group.
50. Maslin, M. 2014. Climate Change: A Very Short Introduction. Oxford Publications.
51. Mathez, E.A. 2009. Climate Change: The Science of Global Warming and our Energy Future. Columbia University Press.
52. Mitra, A.P., Sharma, S., Bhattacharya, S., Garg, A., Devotta, S. & Sen, K. 2004. Climate Change and India. Universities Press, India.
53. Philander, S.G. 2012. Encyclopedia of Global Warming and Climate Change (2nd edition). Sage Publications.
54. Demers, M.N. 2005. Fundamentals of Geographic Information System. Wiley & Sons.
55. Richards, J. A. & Jia, X. 1999. Remote Sensing and Digital Image Processing. Springer.
56. Sabins, F. F. 1996. Remote Sensing: Principles and Interpretation. W. H. Freeman.
57. Gaston, K. J. & Spicer, J.I. 1998. Biodiversity: An Introduction. Blackwell Science, London.
58. Singh, J. S. & Singh, S. P. 1987. Forest vegetation of the Himalaya. The Botanical Review 53:80-192.
59. Sodhi, N.S. & Ehrlich, P.R. (Eds). 2010. Conservation Biology for All. Oxford University Press.
60. Sodhi, N.S., Gibson, L. & Raven, P.H. 2013. Conservation Biology: Voices from the Tropics. Wiley-Blackwell, Oxford, UK.

Suggested equivalent online courses:

1. <https://www.classcentral.com/course/swayam-plant-physiology-and-metabolism-17732>
2. <https://www.wiziq.com/course/3249-plant-physiology-in-10-live-online-classes>
3. <https://www.easybiologyclass.com/plant-physiology-free-lecture-notes-online-tutorials-lecture-notes-ppts-mcqs/>
4. https://onlinecourses.swayam2.ac.in/cec19_bt09/preview
5. <https://community.plantae.org/tags/moocuturelearn.com/courses/teaching-biology-inspiring-students-with-plants-in-science>
6. <https://www.coursera.org/courses?query=plants>
<http://egyankosh.ac.in/handle/123456789/53530>

Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50



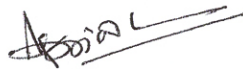

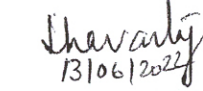
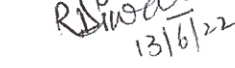
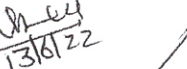


Continuous Comprehensive Evaluation (CCE): As per rule

University Exam (UE): 50 Marks

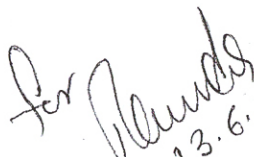
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Declaration

This is to certify that the syllabus is framed by the Central Board of Studies (Botany) as per the guidelines (TOR) of the Department of Higher Education, Raipur Chhattisgarh.

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Part A: Introduction			
Program: B.Sc.		Class: B.Sc. III Year	Year: 2024 Session: 2024-2025
1.	Course Code	BOT-6T	
2.	Course Title	Cytogenetics, plant tissue culture and biometry	
3.	Course Type	Theory	
4.	Pre-requisite (if any)	NO	
5.	Course Learning Outcomes (CLO)	After the completion of the course the students will be able to: <ul style="list-style-type: none"> • Acquire knowledge on cell ultrastructure. • Understand the structure and chemical composition of chromatin and concept of cell division. • Interpret the Mendel's principles, acquire knowledge on cytoplasmic inheritance and sex-linked inheritance • Understand the concept of 'one gene one enzyme hypothesis' along with the molecular mechanism of mutation. • students will be familiar with data handling. 	
6.	Credit Value	Theory: 4	
7.	Total Marks	Max. Marks: 50	Min Passing Marks: 17

Part B: Content of the Course		
Total Periods: 60		
Unit	Topics	No. of Period
I	Cell biology: Structure and function of cell wall, plasma membrane, ribosomes, Endoplasmic reticulum, Golgi apparatus, mitochondria, chloroplast, lysosomes, peroxisomes and cell inclusions. Organization of nucleus: nuclear envelope, nucleoplasm and nucleolus. Chromosomal nomenclature- chromatids, centromere, telomere, satellite, secondary constriction. Organization of chromosomes- Nucleic acid and histones- types and classification. Lampbrush chromosomes and polytene chromosomes- Karyotype and idiogram. Cell cycle: G ₀ , G ₁ , S and G ₂ phases –mitosis: open and closed mitosis –amitosis and meiosis. Chromosomal aberrations (Structural and Numerical)	12
II	Genetics: History of Genetics and Mendelian inheritance, Chromosome theory of inheritance, crossing over and linkage; Incomplete dominance and codominance; Interaction of Genes; Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, Polygenic inheritance; Extra-nuclear Inheritance, Linkage, crossing over, Concept of sex determination and Sex chromosomes; Patterns of Sex determination in plants Sex linked inheritance.	12
III	Genetic material: Miescher to Watson and Crick- historic perspective, Griffith's and Avery's transformation experiments, Hershey-Chase, bacteriophage experiment, DNA structure, types of DNA, types of genetic material. DNA replication (Prokaryotes and eukaryotes): semi- conservative. DNA replication (Prokaryotes and eukaryotes): bidirectional replication, semi- conservative, semi discontinuous RNA priming, θ (theta) mode of replication, replication of linear, dsDNA, replicating the 5' end of linear chromosome including replication enzymes.	12

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IV	<p>Gene mutation and mutagens – substitution- transition and transversion, DNA damage and repairs, physical (ionizing and non- ionising) and chemical mutagens</p> <p>Transcription & Regulation of gene expression</p> <p>Types of structures of RNA (mRNA, tRNA, rRNA), RNA polymerase- various types; Translation, (Prokaryotes and eukaryotes), genetic code-. deciphering and properties. Regulation of gene expression inProkaryotes: Lac operon</p> <p>Plant tissue culture: Principles, components and techniques (preparation of culture media: liquid and solid medium, basal and supplemented media) and culturing of protoplast- principle and application, regeneration of protoplasts, protoplast fusion and somatic hybridization- selection of hybrid cells, Somaclonal variation, Plant secondary metabolites production. Artificial seeds</p>	12
V	<p>Biostatistics: Definition, statistical methods, basic principles, variables- measurements, functions, limitations and uses of statistics. Biometry: Data, Sample, Population, random sampling, Frequency distribution- definition only, Central tendency–Arithmetic Mean, Mode and Median; Measurement of dispersion–Coefficient of variation, Standard Deviation, Standard error of Mean; Test of significance: chi- square test for goodness of fit. Computer application in biostatistics - MS Excel and SPSS</p>	12
<p>Keywords: Mineral nutrition, Carbon assimilation, Nitrogen and lipid metabolism, Natural resource management, Ecological succession, biodiversity conservation</p>		

Part C -Learning Resources

for
13.6.22

Suggested Readings:

1. Cell Biology And Genetics (Hindi) 2/e PB....Gupta P K (Hindi) Rastogi Publications
2. PLANT BIOTECHNOLOGY (HINDI) October 2019 Publisher: Kindle Direct Publishing ISBN: ISBN: 9781698665283 Authors: H. R. Dagla Jai Narain Vyas University
3. Biotechnology: Fundamentals And Application (hindi) (hb) ISBN : 9788177544732 Edition : 03 Year : 2018 Author : Dr. Purohit SS , Mathur S
4. Biotechnology (Hindi) (Hindi, Paperback, B.D.Singh) Hindi Publisher: Kalyani Publishers ISBN: 9789327246070, 9327246071
5. Cytogenetics, Plant Breeding, Evolution and Biostatistics ISBN #: 978-81-301-0066-1 Sunil D Purohit & Gotam K Kukda, Apex Publishing House
6. Genetics and Biotechnology Sunil D Purohit, K. Ahmed & Gotam K Kukda Apex Publishing House
7. Padap Prajnan (Hindi)
8. G.M. Cooper. (2015). The cell: A Molecular Approach. 7th Edition. Sinauer Associates.
9. Alberts, B., Johnson, A.D., Lewis, J., Morgan, D., Raff, M., Roberts, K., Walter, P. (2014). Molecular Biology of Cell. 6th Edition. W.W. Norton & Co.
10. Campbell, M.K. (2012) Biochemistry, 7th ed., Published by Cengage Learning.
11. Campbell, P.N. and Smith, A.D. (2011). Biochemistry Illustrated, 4th ed., Published by Churchill Livingstone
12. Tymoczko, J.L., Berg, J.M. and Stryer, L. (2012). Biochemistry: A short course, 2nd ed., W.H. Freeman.
13. Berg, J.M., Tymoczko, J.L. and Stryer, L. (2011) Biochemistry, W.H. Freeman and Company
14. Nelson, D.L. and Cox, M.M. (2008). Lehninger Principles of Biochemistry, 5th Ed., W.H. Freeman and Company.
15. Karp, G. (2010). Cell Biology, John Wiley & Sons, U.S.A. 6th edition.
16. Hardin, J., Becker, G., Skliensmith, L.J. (2012). Becker's World of the Cell. 8th edition. Pearson Education Inc. U.S.A.)
17. Gardner, E.J., Simmons, M.J., Snustad, D.P. (1991). Principles of Genetics, John Wiley & sons, India. 8th e
18. Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics, John Wiley & Sons Inc., India. 5th edition.
19. Klug, W.S., Cummings, M.R., Spencer, C.A. (2009). Concepts of Genetics. Benjamin Cummings, U.S.A..
20. Griffiths, A.J.F., Wessler, S.R., Carroll, S.B., Doebley, J. (2010). Introduction to Genetic Analysis. W. H. Freeman and Co., U.S.A. 10th edition.
21. M K Raxdan An Introduction to Plant Tissue Culture –; Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi
22. Aggarwal SK (2009) Foundation Course in Biology, 2nd Edition, Ane Books Pvt. Ltd
23. Allard RW (1960) Principles of Plant Breeding. John Wiley and Sons. Inc. New York
24. BD Singh (2003) Plant Breeding. Kalyani Publishers
25. Cohn, N.S. (1964) Elements of Cytology. Brace and World Inc, New Delhi
26. Darnel, J. Lodish, Hand Baltimore, D. (1991) Cell and molecular biology. Lea and Fibiger, Washington.
27. De Robertis, E.D.P and Robertis, E.M.P (1991) Cell and molecular biology Scientific American books.
28. Dobzhansky, B (1961) Genetic and origin of species, Columbia university Press New York
29. Durbin (2007) Biological Sequence Analysis. Cambridge University Press India Pvt. Ltd
30. Gerald Karp (1985) Cell biology, Mc Graw Hill company..
31. Lewin, B, (1994) Genes, Oxford University Press, New York.
32. Lewis, W.H (1980) Polyploidy. Plenum Press, New York.
33. Nicholl T (2007) An Introduction to Genetic Engineering, Cambridge University Press India Pvt. Ltd
34. Roy S.C. and Kalayan Kumar De (1997) Cell biology. New central Books, Calcutta

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Part D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50

Continuous Comprehensive Evaluation (CCE): As per rule


University Exam(UE): 50Marks

For
13.6.22

Declaration

This is to certify that the syllabus is framed by the Central Board of Studies (Botany) as per the guidelines (TOR) of the Department of Higher Education, Raipur Chhattisgarh.

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|--|---|----------|--|
| 1. Shri Prabhat Pandey | - | Chairman | |
| Asst. Prof. | - | Member | |
| Gramya Bharti Vidyapith, Hardibazar | | | |
| 2. Dr. A.N. Bahadur | - | Member | |
| Professor | | | |
| Govt. E.R.R. P.G. Science College, Bilaspur | | | |
| 3. Dr. Prashant Kumar Singh | - | Member | |
| Asst. Prof. | | | |
| Govt. V.B. Singh Dev Girls College, Jashpur | | | |
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| 6. Dr. Smriti Chakravarty | - | Member | |
| Professor | | | |
| Govt. J.Y. Chhattisgarh College, Raipur | | | |
| 7. Dr. Rupinder Diwan | - | Member | |
| Professor | | | |
| Govt. Nagarjun P.G. College of Science, Raipur | | | |
| 8. Dr. Usha Chandel | - | Member | |
| Asst. Prof. | | | |
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| 9. Mr. Kaushal Kishor | - | Member | |
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| Govt. Pt. Shyamacharan Shukla College, Dharsiwa, | | | |
| Raipur | | | |
| 10. Mamisha Gupta | - | Member | |

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