

B.Sc. – VIII Semester

BOTANY

Govt. Digvijay Autonomous P.G. College, Rajnandgaon, C.G.
Bachelor of Science (B.Sc.) Four Years UG Programme (FYUP)

Botany

2025-26

Year	Sem.	Course Type	Course Title	Credit	IA	ESE	Max Marks
First Year	I Sem.	DSC-01	Elementary Botany	3+0+0	30	70	100
		DSC-01-LAB	Elementary Botany – LAB	0+0+1	15	35	50
		GE-01	Elementary Botany	3+0+0	30	70	100
		GE-01-LAB	Elementary Botany – LAB	0+0+1	15	35	50
	II Sem.	DSC-02	Microbes and Thallophyta	3+0+0	30	70	100
		DSC-02-LAB	Microbes and Thallophyta - LAB	0+0+1	15	35	50
		GE-02	Microbes and Thallophyta	3+0+0	30	70	100
		GE-02-LAB	Microbes and Thallophyta - LAB	0+0+1	15	35	50
		SEC-01	Gardening and Floriculture	0+0+2	10	40	50
Second Year	III Sem.	DSC-03	Archegoniate and Fossils	3+0+0	30	70	100
		DSC-03-LAB	Archegoniate and Fossils – LAB	0+0+1	15	35	50
		DSE- 01	Natural resources and management	3+0+0	30	70	100
		DSE-01-LAB	Natural resources and management- LAB	0+0+1	15	35	50
		VAC- 01	Herbal Plants & Human Health	2+0+0	10	40	50
	IV Sem.	DSC- IV	Angiosperms	3+0+0	30	70	100
		DSC- IV- LAB	Angiosperms- LAB	0+0+1	15	35	50
		DSE-02	Microbiology and Phytopathology	3+0+0	30	70	100
		DSE-02-LAB	Microbiology and Phytopathology- LAB	0+0+1	15	35	50
		SEC- 02	Flower Decoration	0+0+2	10	40	50

CVS *OK*

Third Year	V Sem.	DSC-05	Plant Physiology	3+0+0	20	80	100
		DSC-05-LAB	Plant Physiology- LAB	0+0+1	10	40	50
		DSE-03	Plant Metabolism	3+0+0	20	80	100
		DSE-03-LAB	Plant Metabolism- LAB	0+0+1	10	40	50
		DSE-04	Plant Diseases	3+0+0	20	80	100
		DSE-04-LAB	Plant Diseases-LAB	0+0+1	10	40	50
		SEC-03	Biofertilizer and Biopesticides	0+0+2	10	40	50
	VI Sem.	DSC-06	Plant Pathology	3+0+0	20	80	100
		DSC-06-LAB	Plant Pathology-LAB	0+0+1	10	40	50
		DSE-05	Molecular Biology and Plant Biotechnology	3+0+0	20	80	100
		DSE-05-LAB	Molecular Biology and Plant Biotechnology-LAB	0+0+1	10	40	50
		DSE-06	Economic Botany	3+0+0	20	80	100
		DSE-06-LAB	Economic Botany-LAB	0+0+1	10	40	50
		SEC-04	Mushroom Culture Technology-Project	0+0+2	10	40	50
Fourth Year Bachel or of Honors	VII Sem.	DSC-07	Ecology and Phytogeography	3+0+0	20	80	100
		DSC-07-LAB	Ecology and Phytogeography-LAB	0+0+1	10	40	50
		DSE-07	Instrumentation and Biochemical Technology	3+0+0	20	80	100
		DSE-07-LAB	Instrumentation and Biochemical Technology-LAB	0+0+1	10	40	50
		DSE-08	Biosystematics and Biodiversity	3+0+0	20	80	100
		DSE-08-LAB	Biosystematics and Biodiversity-LAB	0+0+1	10	40	50
		DSE-09	Plant Breeding and Seed Technology	3+0+0	20	80	100
		DSE-09-LAB	Plant Breeding and Seed Technology-LAB	0+0+1	10	40	50
		GE-	Growth and Stress Physiology	3+0+0	20	80	100
		GE-LAB	Growth and Stress Physiology-LAB	0+0+1	10	40	50
	VIII Sem	DSC-08	Molecular Biology and Biostatistics	3+0+0	20	80	100
		DSC-08-	Molecular Biology and	0+0+1	10	40	50

Fourth Year Bachelor of Honors with Research		LAB	Biostatistics- LAB				
		DSE-10	Plant Biotechnology and Crop Improvement	3+0+0	20	80	100
		DSE-10-LAB	Plant Biotechnology and Crop Improvement-LAB	0+0+1	10	40	50
		DSE-11	Applied Botany and Intellectual Property Right (IPR)	3+0+0	20	80	100
		DSE-11-LAB	Applied Botany and Intellectual Property Right (IPR)-LAB	0+0+1	10	40	50
		DSE-12	Biochemistry and Enzymology	3+0+0	20	80	100
		DSE-12-LAB	Biochemistry and Enzymology-LAB	0+0+1	10	40	50
		DSE-13	Bioinformatics and Genetic Technology	3+0+0	20	80	100
		DSE-13-LAB	Bioinformatics and Genetic Technology-LAB	0+0+1	10	40	50
	VII Sem.	DSC-07	Ecology and Phytogeography	3+0+0	20	80	100
		DSC-07-LAB	Ecology and Phytogeography-LAB	0+0+1	10	40	50
		DSE-07	Research Methodology and Ethics	4+0+0	20	80	100
		DSE-08	Biosystematics and Biodiversity	3+0+0	20	80	100
		DSE-08-LAB	Biosystematics and Biodiversity-LAB	0+0+1	10	40	50
		DSE-09	Plant Breeding and Seed Technology	3+0+0	20	80	100
		DSE-09-LAB	Plant Breeding and Seed Technology-LAB	0+0+1	10	40	50
		GE-	Growth and Stress Physiology	3+0+0	20	80	100
		GE-LAB	Growth and Stress Physiology-LAB	0+0+1	10	40	50
	VIII Sem	DSC-08	Molecular Biology and Biostatistics	3+0+0	20	80	100
		DSC-08-LAB	Molecular Biology and Biostatistics- LAB	0+0+1	10	40	50
		DSE-10	Plant Biotechnology and Crop Improvement	3+0+0	20	80	100
		DSE-10-LAB	Plant Biotechnology and Crop Improvement-LAB	0+0+1	10	40	50
		Research Project/ Dissertation		12			

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF BOTANY
COURSE CURRICULUM

PART- A: Introduction			
Program: Bachelor in Life Sciences (Honors)		Semester - VIII	Session: ²⁰²⁵⁻²⁶ 2024-2025
1	Course Code	BOSC –VIII T	
2	Course Title	Molecular biology and Biostatistics	
3	Course Type	Discipline Specific course (DSC)	
4	Pre-requisite (if, any)	As per program	
5	Course Learning Outcomes (CLO)	<ul style="list-style-type: none"> ➤ Students should know about cellular and gene regulation to understand genomic functions ➤ Understand the concept of 'one gene one enzyme hypothesis' along with the molecular mechanism of mutation ➤ Students will be familiar with the genetic material DNA structure its role and defects and repairing ➤ Students will be familiar with the RNA structure its role ➤ Students will be familiar with data handling. 	
6	Credit Value	3 Credits	Credit = 15 Hours - learning & Observation
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40
PART -B: Content of the Course			
Total No. of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours)			
Unit	Topics (Course contents)		No. of Period
I	Nucleic acids: Carriers of genetic information. Introduction, DNA as the carrier of genetic information (Griffith's, McLeod & McCarty experiment). The Structures of DNA and RNA / Genetic Material DNA Structure: Watson and Crick model, Salient features of double helix, Organization of DNA Prokaryotes, Viruses, Eukaryotes. Types- A-DNA, B-DNA C- DNA Z- DNA RNA Structure –mRNA, tRNA and rRNA Organelle DNA -- mitochondria and chloroplast DNA. The replication of DNA Chemistry of DNA synthesis General principles – bidirectional, semiconservative and semi discontinuous replication Enzymes involved in DNA replication.		12
II	Mutation and DNA repair Structural and numerical changes in the chromosomes- chromosomal aberration- duplication, deletion, inversion, translocation, gene mutation- transition and transversion, polyploidy- euploidy and aneuploidy.. DNA damage and repair		11
III	Protein synthesis and gene regulation Genetic code Genetic code (deciphering and salient features) Transcription Concept of central dogma, Transcription in prokaryotes and eukaryotes. Principles of transcriptional regulation; Prokaryotes: Regulation of lactose metabolism and tryptophan synthesis in E.coli. Gene silencing. Processing and modification of RNA Split genes-concept of introns and exons, removal of introns, spliceosome machinery, splicing pathways, group I and group II intron splicing, alternative splicing eukaryotic mRNA processing (5' cap, 3' polyA tail). Translation Ribosome structure and assembly, mRNA: aminoacyl tRNA synthetases; Various steps in protein synthesis, proteins involved in initiation, elongation and termination of polypeptides, Fidelity of translation; Inhibitors of protein synthesis; Post-translational modifications of proteins.		11
IV	Biostatistics : Graph, central tendency (Mean, median and mode) Standard Deviation, Standard error Chi square test, regression, degree of freedom		11
Keywords	DNA, RNA, protein synthesis, gene regulation, central tendency		
Signature of Convener & Members (CBoS) :			

1. R. K. Jaiswal
 2. R. K. Jaiswal
 3. Anil Kumar
 4. Anil Kumar
 5. H. K.

6. Anil Kumar
 7. Anil Kumar
 8. Anil Kumar
 9. Anil Kumar
 10. Anil Kumar

CS

OP

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. Watson J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M., Losick, R. (2007). Molecular Biology of the Gene, Pearson Benjamin Cummings, CSHL Press, New York, U.S.A. 6th edition.
2. Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics. John Wiley and Sons Inc., U.S.A. 5th ed.
3. Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics. John Wiley and Sons, U.K. 5th edition.
4. Sharma A.K. 2005. Text Book Of Biostatistics I, Discovery Publishing House.
5. Annadurai, B. 2007. Text Book of Biostatistics. New Age International.
6. Gurumani, N. 2010. An Introduction to Biostatistics (2nd Edn). MJP Publishers.

Reference books:

1. Klug, W.S., Cummings, M.R., Spencer, C.A. (2009). Concepts of Genetics. Benjamin Cummings. U.S.A. 9th edition.
2. Russell, P. J. (2010). i-Genetics- A Molecular Approach. Benjamin Cummings, U.S.A. 3rd edition.
3. Griffiths, A.J.F., Wessler, S.R., Carroll, S.B., Doebley, J. (2010). Introduction to Genetic Analysis. 6. W. H. Freeman and Co., U.S.A. 10th edition.
4. Glick, B.R., Pasternak, J.J. (2003). Molecular Biotechnology- Principles and Applications of recombinant DNA. ASM Press, Washington.

Online Resources–

- e-Resources / e-learning portals
- www.swavam.ac.in
- www.ignou.ac.in
- www.egvankosh.ac.in
- www.iitm.ac.in
- www.eskillindia.org
- www.eshiksha.mp.gov.in
- www.vlab.co.in
- www.internshala.com
- www.ndl.iitkgp.ac.in

Online Resources–

- e-Resources / e-books and e-learning portals
- <https://www.springer.com/gp/book/9789811391767>
- <https://www.springer.com/gp/book/9789811550720>
- https://www.asct.com/ASCTWeb/Content/Cytopreparation_Online_Course.aspx
- <https://www.mooc-list.com/tags/genetics>
- <https://www.coursera.org/learn/genetics-evolution>
- <https://www.my-mooc.com/en/mooc/introduction-to-genetics-and-evolution/>

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks:	100 Marks
Continuous Internal Assessment (CIA):	30 Marks 20
End Semester Exam (ESE):	70 Marks 80

Continuous Internal Assessment (CIA): 30 (By Course Teacher) 20	Internal Test / Quiz-(2): 20 +20/10 Assignment / Seminar - 10 Total Marks - 20 30	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks 20
End Semester Exam (ESE): 70 80	Two section – A & B Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 =20 Marks Section B: Descriptive answer type qts., 1out of 2 from each unit-4x10=40 Marks	

Name and Signature of Convener & Members of CBoS:

① R. P. Rao
② R. P. Rao
③ R. P. Rao
④ R. P. Rao
⑤ R. P. Rao
⑥ R. P. Rao
⑦ R. P. Rao
⑧ R. P. Rao
⑨ R. P. Rao
⑩ R. P. Rao
⑪ R. P. Rao
⑫ R. P. Rao
⑬ R. P. Rao
⑭ R. P. Rao
⑮ R. P. Rao
⑯ R. P. Rao
⑰ R. P. Rao
⑱ R. P. Rao
⑲ R. P. Rao
⑳ R. P. Rao
㉑ R. P. Rao
㉒ R. P. Rao
㉓ R. P. Rao
㉔ R. P. Rao
㉕ R. P. Rao
㉖ R. P. Rao
㉗ R. P. Rao
㉘ R. P. Rao
㉙ R. P. Rao
㉚ R. P. Rao
㉛ R. P. Rao
㉜ R. P. Rao
㉝ R. P. Rao
㉞ R. P. Rao
㉟ R. P. Rao
㊱ R. P. Rao
㊲ R. P. Rao
㊳ R. P. Rao
㊴ R. P. Rao
㊵ R. P. Rao
㊶ R. P. Rao
㊷ R. P. Rao
㊸ R. P. Rao
㊹ R. P. Rao
㊺ R. P. Rao
㊻ R. P. Rao
㊼ R. P. Rao
㊽ R. P. Rao
㊾ R. P. Rao
㊿ R. P. Rao

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF BOTANY COURSE CURRICULUM

PART- A: Introduction			
Program: Bachelor in Life Sciences (Honors)		Semester - VIII	Session: 2024-2025 2025-26
1	Course Code	BOSC -08 P	
2	Course Title	Lab. Course-08 (Molecular biology and Biostatistics)	
3	Course Type	Laboratory course	
4	Pre-requisite (if, any)	As per program	
5	Course Learning Outcomes (CLO)	After the completion of the course the students will be able to: <ul style="list-style-type: none"> > Isolate DNA from plant cell and <i>E. Coli</i>. > Learn chimera formation in various plants. > Understand the functioning and application of spectrophotometer. > Understand the interpretation of data with the help of statistical data. 	
6	Credit Value	1 Credits	Credit =30 Hours Laboratory or Field learning/Training
7	Total Marks	Max. Marks: 50	Min Passing Marks: 20
PART -B: Content of the Course			
Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)			
Module	Topics (Course contents)		No. of Period
Lab./Field Training/ Experiment Contents of Course	<ul style="list-style-type: none"> > Isolation of DNA from plant cells. > Quantitative measurement of DNA by Spectrophotometric method. > Feulgen or hydrolytic staining of DNA. > Chimera formation in Bougainvillea and other ornamental and other different plants. > Isolation of plasmid DNA from <i>E. coli</i>. > Isolation of <i>Rhizobium</i> from root nodules of leguminous plants. > Isolation of <i>Agrobacterium tumefaciens</i> from tumours of dicot plants. > Preparation of LB medium and raising <i>E. Coli</i>. > DNA estimation by diphenylamine reagent/UV Spectrophotometry. > Analysis of statistical data: Statistical tables, Central tendency - mean mode, median, standard deviation and standard error (using seedling population /leaflet size etc). > Calculation of correlation coefficient values and finding out the probability. > Computer application in biostatistics - MS Excel and SPSS 		30
Keywords	Spectrophotometer, Plasmid, colchicine, <i>E. Coli</i> , Central tendencies.		
Signature of Convener & Members (CBoS) :			

① Rhinoceros
② Rhinoceros
③ Rhinoceros
④ Rhinoceros

⑤ Rhinoceros

⑥ Rhinoceros

⑦ Rhinoceros

⑧ Rhinoceros

⑨ Rhinoceros

⑩ Rhinoceros

Gas PR

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. . Raghvan, V. (1997) Molecular Biology of Flowering Plants. Cambridge Univ. Press, New York, USA.
2. Biotechnology by B.D. Singh
3. Biotechnology by R.S. Singh
4. Practical Biotechnology: Principles and Protocols by Swagat Kumar Das Hrudayanath Thatoi, Supriya Dash.

Reference Books Recommended –

1. Zar, J.H. (2012). *Biostatistical Analysis*. Pearson Publication. U.S.A. 4th edition.
2. Brown, T. A. (1999) Genomes. John Wiley and Sons Asia Pvt. Ltd., Singapore.
3. Callow, J. A. Ford-Loyd, B. V. and Newbury, H. J. (1997) Biotechnology and Genetic Resources: Conservation and Use. Cab International, Oxon, UK.
4. Glazer, A. N. and Nikaido, H. (1995) Microbial Biotechnology. Freeman and Company, New York, USA.
5. Hennery, R. J. (1997) Practical Applications of Plant Molecular Biology. Chapman and Hall, London UK.
6. Jolles, O. And Jornvali, H. (2000) Proteomics in Functional Genomics. Birkhauser Verlag, Basel, Switzerland.
7. Old, R. W. Primerose, S. B. (1989) Principles of Gene Manipulation. Blackwell Scientific Publications, Oxford UK.
8. Primrose, S. B. (1995) Principles of Genome Analysis, Blackwell Scientific Publications, Oxford, UK

Online Resources–

➤ e-Resources / e-books and e-learning portals

- www.swayam.ac.in
- www.ignou.ac.in
- www.egyankosh.ac.in
- www.iitm.ac.in
- www.eskillindia.org
- www.eshiksha.mp.gov.in
- www.vlab.co.in
- www.internshala.com
- www.ndl.iitkgp.ac.in

Online Resources–

➤ e-Resources / e-books and e-learning portals

- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4890884/>
- https://www.k-state.edu/wgrc/electronic_lab/feul_stain_prot.html
- https://www.westga.edu/academics/research/vrc/assets/docs/spss_basics.pdf
- <https://www.analyticsvidhya.com/blog/2021/11/a-comprehensive-guide-on-microsoft-excel-for-data-analysis/>
- <https://handelsmanlab.discovery.wisc.edu/wp-content/uploads/2018/01/Arapidmethod1989.pdf>
- <https://byjus.com/maths/central-tendency/>

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

Continuous Internal Assessment (CIA): ~~45~~ Marks 10

End Semester Exam (ESE): ~~35~~ Marks 40

Continuous Internal Assessment (CIA): 45 (By Course Teacher) 10	Internal Test / Quiz-(2): 10 & 10/5 Assignment/Seminar + Attendance - 05 Total Marks - 10 45	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 45 Marks 10
--	---	---

End Semester Exam (ESE): ~~35~~ 40

Laboratory / Field Skill Performance: On spot Assessment
A. Performed the Task based on lab. work - 20 Marks
B. Spotting based on tools & technology (written) - 10 Marks
C. Viva-voce (based on principle/technology) - 05 Marks

Managed by Course teacher as per lab. status

Name and Signature of Convener & Members of CBoS:

① Rishu
② Rishi
③ Mallik
④ K. S.
⑤ K.

⑥ K.
⑦ G. N.
⑧ K. S.
⑨ K. S.
⑩ K. S.

Signature of Convener: [Signature]
Signature of Members: [Signature]

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF BOTANY

COURSE CURRICULUM

PART- A: Introduction			
Program: Bachelor in Life Science (Honors)		Semester -VIII	Session: 2025-26 2024-2025
1	Course Code	BOSE - 101 10 T	
2	Course Title	Plant Biotechnology and Crop Improvement	
3	Course Type	Discipline specific Elective (DSE)	
4	Pre-requisite (if, any)	As per program	
5	Course Learning Outcomes (CLO)	<input type="checkbox"/> At the end of this course, the students will be able to <ul style="list-style-type: none"> ➤ The basic concept, scope and significance of Biotechnology. ➤ Micropropagation using meristem and shoot culture to produce large number of identical individuals. ➤ The role of biotechnology in crop improvement. ➤ Various applications of Biotechnology in different fields. 	
6	Credit Value	3 Credits	Credit = 15 Hours - learning & Observation
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40
PART -B: Content of the Course			
Total No. of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours)			
Unit	Topics (Course contents)		No. of Period
I	Fundamentals of Biotechnology: Basic concepts, principles and scope. Plant Cell and Tissue Culture: General concept, history, scope, totipotency, concept of cellular differentiation, tissue culture media and explants. Applications of Plant Biotechnology.		12
II	Organogenesis and Embryogenesis: Concept of morphogenesis, organogenesis and embryogenesis; Fundamental aspects of organogenesis in plant tissue culture, factors influencing organogenesis; somatic embryogenesis and androgenesis - mechanism, techniques and utility.		11
III	Somatic Hybridization: Concept of somatic fusion and hybridization; Protoplast isolation, fusion and culture, hybrid selection and regeneration; progress, possibilities, achievements and limitations of protoplast research.		11
IV	Application of Plant Tissue Culture in crop improvement: Clonal propagation, artificial seed, production of hybrids and soma clones, Soma clonal variation – cause & advantages and its application in crop improvement; production of secondary metabolites / natural products, cryopreservation and germplasm storage.		11 (11Hr)
Keywords	Biotechnology, Tissue Culture, Crop improvement, Clonal propagation		

Signature of Convener & Members (CBoS):

① R. Sivas
 ② S. Sivas
 ③ S. Sivas
 ④ S. Sivas
 ⑤ S. Sivas
 ⑥ S. Sivas
 ⑦ S. Sivas
 ⑧ S. Sivas
 ⑨ S. Sivas
 ⑩ S. Sivas
 ⑪ S. Sivas
 ⑫ S. Sivas
 ⑬ S. Sivas
 ⑭ S. Sivas
 ⑮ S. Sivas
 ⑯ S. Sivas
 ⑰ S. Sivas
 ⑱ S. Sivas
 ⑲ S. Sivas
 ⑳ S. Sivas
 ㉑ S. Sivas
 ㉒ S. Sivas
 ㉓ S. Sivas
 ㉔ S. Sivas
 ㉕ S. Sivas
 ㉖ S. Sivas
 ㉗ S. Sivas
 ㉘ S. Sivas
 ㉙ S. Sivas
 ㉚ S. Sivas
 ㉛ S. Sivas
 ㉜ S. Sivas
 ㉝ S. Sivas
 ㉞ S. Sivas
 ㉟ S. Sivas
 ㊱ S. Sivas
 ㊲ S. Sivas
 ㊳ S. Sivas
 ㊴ S. Sivas
 ㊵ S. Sivas
 ㊶ S. Sivas
 ㊷ S. Sivas
 ㊸ S. Sivas
 ㊹ S. Sivas
 ㊺ S. Sivas
 ㊻ S. Sivas
 ㊼ S. Sivas
 ㊽ S. Sivas
 ㊾ S. Sivas
 ㊿ S. Sivas

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. Bhojwani, S. S and Razdan, N.K. (1996) Plant Tissue Culture: Theory and Practice, Elsevier Science Publishers, New York, USA
2. Kartha, K.K. (1985) Cryopreservation of Plant Cells and Organs. CRC Press, Boca Raton, Florida, USA.
3. Vasil, I. K. and Thorbe, T. A. (1994) Plant Cell and Tissue Culture. Kluwer Academic Publishers, Netherlands.

Reference Books Recommended –

1. Smith, R. H. (2000) Plant Tissue Culture; Techniques and Experiments, Academic Press, New York.
2. Collins, H.A. and Edwards, S. (1998) Plant Cell Culture, Bios. Scientific Publisher Oxford, U.K.

Online Resources–

- e-Resources / e-books and e-learning portals
- <https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/plant-biotechnology#:~:text=Plant%20Tissue%20Culture%2DBased%20Industries&text=Plant%20tissue%20culture%20in%20agricultural,into%20next%20step%20of%20commercialization>.
- <https://www.nifa.usda.gov/grants/programs/biotechnology-programs/plant-biotechnology>
- <https://agricultureandfoodsecurity.biomedcentral.com/articles/10.1186/s40066-022-00369-2>

Online Resources–

- e-Resources / e-books and e-learning portals
- www.swayam.ac.in
- www.ignou.ac.in
- www.egyankosh.ac.in
- www.iitm.ac.in
- www.eskillindia.org
- www.eshiksha.mp.gov.in
- www.vlab.co.in
- www.internshala.com
- www.ndl.iitkgp.ac.in

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks 20

End Semester Exam (ESE): 70 Marks 80

Continuous Internal
Assessment (CIA): 30
(By Course Teacher) 20

Internal Test / Quiz (2): 20 +20/
Assignment / Seminar - 10
Total Marks - 20 34

Better marks out of the two Test / Quiz +
obtained marks in Assignment shall be
considered against 30 Marks 20

End Semester Exam
(ESE): 70 80

Two section – A & B

Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 =20 Marks
Section B: Descriptive answer type qts., 1out of 2 from each unit-4x10=40 Marks

Name and Signature of Convener & Members of CBOS:

① P. Jaiswal
② P. Jaiswal
③ P. Jaiswal
④ P. Jaiswal
⑤ P. Jaiswal
⑥ P. Jaiswal

⑦ P. Jaiswal
⑧ P. Jaiswal
⑨ P. Jaiswal
⑩ P. Jaiswal

CBOS PR

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF BOTANY

COURSE CURRICULUM

PART- A: Introduction			
Program: Bachelor in Life Science (Honors)		Semester - VIII	Session: ²⁰²⁵⁻²⁶ 2024-2025
1	Course Code	BOSE- 100 10P	
2	Course Title	Lab. Course -09 (Plant biotechnology and crop improvement)	
3	Course Type	Laboratory course	
4	Pre-requisite (if, any)	As per program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to understand- > The basic techniques of Plant Tissue Culture. > Screening programmes of cells, rather than plants, for advantageous characters. > The biochemical and physiological aspects of plant growth. > How to explore entrepreneurship avenues in this field.	
6	Credit Value	1 Credits	Credit =30 Hours Laboratory or Field learning/Training
7	Total Marks	Max. Marks: 50	Min Passing Marks: 20
PART -B: Content of the Course			
Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)			
Module	Topics (Course contents)		No. of Period
Lab./Field Training/ Experiment Contents of Course	1. Familiarization with basic equipments in tissue culture. 2. Preparation of tissue culture (MS) medium. 3. Study of techniques of tissue culture: sterilization of glass wares and plant materials, transfer of explants on culture media, incubation. Up to callus formation 4. Initiation of organogenesis and embryogenesis using appropriate explants. 5. Isolation of plant protoplast by mechanical and enzymatic method 6. Test of viability by tetrazolium chloride (TZ) method. 7. Counting of protoplast in the suspension by haemocytometre method 8. Effect of physical and chemical factors in protoplast yield. 9. Demonstration of protoplast fusion employing PEG. 10. Visit to any tissue culture lab of your locality and a prepare project report.		30
Keywords	Medium, protoplast, tissue culture, TZ		

Signature of Convener & Members (CBoS) :

① *[Signature]*
 ② *[Signature]*
 ③ *[Signature]*
 ④ *[Signature]*
 ⑤ *[Signature]*
 ⑥ *[Signature]*
 ⑦ *[Signature]*
 ⑧ *[Signature]*
 ⑨ *[Signature]*
 ⑩ *[Signature]*

[Signature]

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. "Plant Tissue and Organ Culture fundamental Methods" by Gamburg OL and Philips GC, Publisher – Springer- verlag Heidelberg GmbH & Co. K
2. Practical Biotechnology by Ramadass Jaypee Brothers Medical Publishers

Reference Books Recommended

1. Biotechnology : fundamental and application by Ashok Ganguli, Publisher- Oxford book company

Online Resources–

- e-Resources / e-books and e-learning portals
- <https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/plant-biotechnology#:~:text=Plant%20Tissue%20Culture%2DBased%20Industries&text=Plant%20tissue%20culture%20in%20agricultural,into%20next%20step%20of%20commercialization.>
- <https://www.nifa.usda.gov/grants/programs/biotechnology-programs/plant-biotechnology>
- <https://agricultureandfoodsecurity.biomedcentral.com/articles/10.1186/s40066-022-00369-2>

Online Resources–

- e-Resources / e-books and e-learning portals
- www.swayam.ac.in
- www.ignou.ac.in
- www.egyankosh.ac.in
- www.iitm.ac.in
- www.eskillindia.org
- www.eshiksha.mp.gov.in
- www.vlab.co.in
- www.internshala.com
- www.ndl.iitkgp.ac.in

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

Continuous Internal Assessment (CIA): 15 Marks 10

End Semester Exam (ESE): 35 Marks 40

Continuous Internal Assessment (CIA): 15 (By Course Teacher) 10	Internal Test / Quiz-(2): 10 & 10/5 Assignment/Seminar + Attendance - 05 Total Marks - 10 15	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks 10
End Semester Exam (ESE): 35 40	Laboratory / Field Skill Performance: On spot Assessment A. Performed the Task based on lab. work - 20 Marks B. Spotting based on tools & technology (written) - 10 Marks C. Viva-voce (based on principle/technology) - 05 Marks	Managed by Course teacher as per lab. status

D. Sessional

- 05 Marks

Name and Signature of Convener & Members of CBoS:

- ① R. D. S. Rao
- ② P. K. S. Rao
- ③ M. S. Rao
- ④ S. S. Rao
- ⑤ S. S. Rao
- ⑥ S. S. Rao

- ⑦ S. S. Rao
- ⑧ S. S. Rao
- ⑨ S. S. Rao
- ⑩ S. S. Rao

C. S. Rao

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF BOTANY

COURSE CURRICULUM

PART- A: Introduction			
Program: Bachelor in Life Science (Honors)		Semester - VIII	Session: 2025-26 2024-2025
1	Course Code	BOSE - 11)) T	
2	Course Title	Applied Botany and Intellectual property right (IPR)	
3	Course Type	Discipline specific Elective (DSE)	
4	Pre-requisite (if, any)	As per program	
5	Course Learning Outcomes (CLO)	At the end of the course, the students will be able to: ➤ Understand the scope and importance of Social forestry and establishment of orchard. ➤ Learn silvics of some important timber plants of India. ➤ Learn post-harvest management, marketing and value addition of commercial ornamental plants. ➤ Develop a deep understanding of different forms of intellectual property Rights (IPR)	
6	Credit Value	3 Credits	Credit = 15 Hours - learning & Observation
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40
PART -B: Content of the Course			
Total No. of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours)			
Unit	Topics (Course contents)		No. of Period
I	Social forestry: Introduction, Definition, scope and objectives of social forestry. Classification of social forestry, Economic importance of social forestry, important scheme, choice of species for reclamation of waste land, over damp area, saline and alkaline area .Layout and Establishment of Orchards: Pruning and training; propagation, Climatic requirement and cultivation of fruits like Mango, Banana, Citrus, Guava.		12
II	Silviculture: Definition, objective and scope of silviculture. Status of forest in India and their role. Trees and their distinguishing features. Regeneration: Natural, artificial and factors Affecting it. Regeneration Survey. Tending operation: Weeding, cleaning, thinning and improvement felling. Silvics of important forest tree species e.g. Teak, Shorea, Sheesam .		11
III	Floriculture; History of Floriculture. Importance and scope of floriculture in India. Flower production - water and nutrient management, weed management, thinning and pruning, disbudding, use of growth regulators, physiological disorders and remedies, Harvesting techniques, post-harvest handling, pre-cooling, pulsing, packing, storage & transportation. Prolonging the vase life of flowers. Marketing and export potential of flowers, institutional support.		11
IV	IPR: Definition and significance of intellectual property rights (IPR), Overview of different types of IPR, including patents and its filing process, copyrights, trademarks their registration and infringement, trade secrets, Historical development and international frame works for protecting IPR, Salient feature of Patent Act 1970.		11
Keywords Social forestry, Orchard, Harvesting technique, Trademark			

Signature of Convener & Members (CBoS) :

① *[Signature]*
 ② *[Signature]*
 ③ *[Signature]*
 ④ *[Signature]*
 ⑤ *[Signature]*
 ⑥ *[Signature]*
 ⑦ *[Signature]*
 ⑧ *[Signature]*
 ⑨ *[Signature]*
 ⑩ *[Signature]*
 ⑪ *[Signature]*
 ⑫ *[Signature]*

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended—

1. S. S. Negi: Social forestry
2. S.A.Shah & K.M.Tiwari: Forestry and people
3. G.P.D.Vyas: Social forestry and rural development
4. Jyoti Rattan 2024.Intellectual Property Rights

Reference Books Recommended –

1. Khanna,L.S.(1984).Principles and Practice of Silviculture,Khanna Bhandu,DehraDun.
2. Ram Prakash and L.S.Khanna.(1991)Theory and Practice of Silvicultural systems. International Book Distributors, Dehra Dun.
3. Champman, G.W.and Allan,T.G.(1978).Establishment Techniques for Forest Plantation F.A.O Forestry Paper No.8. F.A.O Rome.
4. Anonymous.(1976)Indian forest utilization.Volume Iand III CFRE Publication,Dehradun.
5. Mehta,T.(1981)A hand book of forest utilization.Periodical Expert Book Agency,Delhi.298

OnlineResources –

e-Resources/e-books and e-learning portals

www.ipindia.gov.in

www.wipo.int/aboutip/en/

[www.india.gov.in /topics/agriculture/floriculture](http://www.india.gov.in/topics/agriculture/floriculture)

[https://byjus.com/free-ias-prep/ipr-in-india-upsc notes/](https://byjus.com/free-ias-prep/ipr-in-india-upsc-notes/)

<https://vikaspedia.in/agriculture/farm-based-enterprises/floriculture>

Online Resources–

➤ e-Resources / e-books and e-learning portals

- www.swayam.ac.in
- www.ignou.ac.in
- www.egvankosh.ac.in
- www.iitm.ac.in
- www.eskillindia.org
- www.eshiksha.mp.gov.in
- www.vlab.co.in
- www.internshala.com
- www.ndl.iitkgp.ac.in

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): ~~30~~ Marks 20

End Semester Exam (ESE): ~~70~~ Marks 80

Continuous Internal Assessment (CIA): 30 20 (By Course Teacher)	Internal Test / Quiz-(2): 20 +20 /10 Assignment / Seminar - 10 Total Marks - 20 30	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks 20
---	---	--

End Semester Exam (ESE): 70 80	Two section – A & B Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 =20 Marks Section B: Descriptive answer type qts., 1out of 2 from each unit-4x10=40 Marks
---	---

Name and Signature of Convener & Members of CBoS:

① R. P. Singh
② R. P. Singh
③ R. P. Singh
④ R. P. Singh
⑤ R. P. Singh
⑥ R. P. Singh
⑦ R. P. Singh
⑧ R. P. Singh
⑨ R. P. Singh
⑩ R. P. Singh

PR

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF BOTANY

COURSE CURRICULUM

PART- A: Introduction		
Program: Bachelor in Life Science (Honors)		Semester - VIII
		Session: ²⁰²⁵⁻²⁶ 2024-2025
1	Course Code	BOSE- 102 11P
2	Course Title	Lab. Course -10 (Applied Botany and Intellectual Property Rights)
3	Course Type	Laboratory course
4	Pre-requisite (if, any)	As per program
5	Course Learning Outcomes (CLO)	At the end of this course, students will be able to: <ul style="list-style-type: none"> ➤ Understand forest structure and composition. ➤ Get knowledge about phenology of various species. ➤ Learn nursery bed preparation technique. ➤ Analyze the density and moisture content of wood.
6	Credit Value	1 Credits
7	Total Marks	Max. Marks: 50
		Min Passing Marks: 20
PART -B: Content of the Course		
Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)		
Module	Topics (Course contents)	No. of Period
Lab./Field Training/ Experiment Contents of Course	<ul style="list-style-type: none"> • Study of forest composition. • Recording the observations on phenological characteristics of different tree species. • Study of the natural and artificial regeneration. • Lay outting of nursery bed and soil preparation, types of seed sowing in nursery bed. • Study of gross features of different types of wood; straight interlocked, spiral and wavy grain, texture, lusture, etc. • Study of characteristics of trees/shrubs/grasses for agroforestry. • Volume and biomass estimation. • Crown measurement. • Study of vase life extension in cut flower using chemicals. • Study and description of botanical features of floricultural plants studied in theory paper. • Drafting a patent application: Students can learn how to draft a patent application for a new invention . • Trademark registration process: Students can learn how to register a trademark in India. 	30
Keywords	Phenological, Wood grain, Nursery bed, Regeneration	

Signature of Convener & Members (CBoS) :

① R. P. Rao

② R. P. Rao

③ H. P. Rao

④ H. P. Rao

⑤ H. P. Rao

⑥ H. P. Rao

⑦ H. P. Rao

⑧ H. P. Rao

⑨ H. P. Rao

⑩ H. P. Rao

CCS

RP

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. Chundawat D S and Gautam SK (2010) Textbook of agroforestry. Oxford and IBH publishing co pvt. Ltd.
2. Nair, P.K.R. (1993) An introduction to agroforestry. Kluwer Academic Publishers. 499 p. 4. Huxley, P. (1999) Tropical agroforestry. Blackwell Science, Oxford.
3. Khosla, P.K. and Khurana, D.K. (1987) Agroforestry for rural needs. Vol. I and II, ISTS, Solan, H.P.
4. Ong, C.K. and Huxley, P.K. (1996) Tree crop interactions - A physiological approach. ICRAF, Kenya.
5. Ramakrishnan, P.S. (1992) Shifting agriculture and sustainable development. Man and biosphere series. The Parthenon Publishing Group.
6. SenSarma, P.K. and Jha, L.K. (1993) Agroforestry. Indian Perspectives. Ashish Publishers, Delhi. 5. Khanna, L. S. (1984). Principles and Practice of Silviculture, KhannaBhandu, Dehra Dun.
7. Ram Prakash and L.S. Khanna. (1991) Theory and Practice of Silvicultural systems. International Book Distributors, Dehra Dun.

Reference Books Recommended –

1. Champman, G.W. and Allan, T.G. (1978). Establishment Techniques for Forest Plantation F.A.O Forestry Paper No.8. F.A.O Rome.
2. Anonymous. (1976) Indian forest utilization. Volume I and II ICFRE Publication, Dehradun.
3. Mehta, T. (1981) A handbook of forest utilization. Periodical Expert Book Agency, Delhi. 298
4. "Floriculture Principles and Species" by Dhiman Mukherjee
5. "Floriculture in India" by Jyotsna Singh and Ramesh Chandra
6. "Floriculture: A Basic Guide" by K.V. Peter
7. "Handbook of Flowering" by Jitendra Kumar
8. "Commercial Floriculture: Principles and Practices" by A.P. Misra and V.P. Singh
9. Intellectual Property Rights and Biotechnology by Shashikala Gurpur and Sreenivasulu N.S.
10. Intellectual Property Rights and Plant Biotechnology by Ramanujam Srinivasan
11. Intellectual Property Rights: An Overview by Arul George Scaria

Online Resources–

➤ e-Resources / e-books and e-learning portals

- <https://ipindia.gov.in/form-and-fees.htm>
- <https://www.indiafilings.com/trademark-registration?matchtype=e&device>
- <https://www.youtube.com/watch?v=S7F6bCRBUDg&t=111s>
- <https://www.youtube.com/watch?v=SrWcYWzJJJ8>
- <https://www.youtube.com/watch?v=tYysC0dwtU0>
- https://www.youtube.com/watch?v=U5_nynPVdTY
- <https://www.youtube.com/watch?v=7faqx7N-pS4>
- <https://www.youtube.com/watch?v=AQdEXkVFGew>
- <https://www.youtube.com/watch?v=uDWilCvc3lQ>

Online Resources–

➤ e-Resources / e-books and e-learning portals

- www.swayam.ac.in
- www.ignou.ac.in
- www.egyankosh.ac.in
- www.iitm.ac.in
- www.eskillindia.org
- www.esniksha.mp.gov.in
- www.vlab.co.in
- www.internshala.com
- www.ndl.iitkgp.ac.in

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks
 Continuous Internal Assessment (CIA): 15 Marks 10
 End Semester Exam (ESE): 35 Marks 40

Continuous Internal Assessment (CIA): 15 (By Course Teacher) 10	Internal Test / Quiz-(2): 10 & 10 Assignment/Seminar + Attendance - 05 Total Marks - 10	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks 10
---	---	--

End Semester Exam (ESE): 35 40	Laboratory / Field Skill Performance: On spot Assessment A. Performed the Task based on lab. work - 20 Marks B. Spotting based on tools & technology (written) - 10 Marks C. Viva-voce (based on principle/technology) - 05 Marks - 05 marks	Managed by Course teacher as per lab. status
--------------------------------	--	--

Name and Signature of Convener & Members of CBOs:

① R. Singh

② Anurag

③ [Signature]

④ [Signature]

⑤ [Signature]

⑥ [Signature]

⑦ [Signature]

⑧ [Signature]

⑨ [Signature]

⑩ [Signature]

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF BOTANY

COURSE CURRICULUM

PART- A: Introduction			
Program: Bachelor in Life Science (Honors)		Semester - VIII	Session: 2025-26 2024-2025
1	Course Code	BOSE - 12 12 T	
2	Course Title	Biochemistry and Enzymology	
3	Course Type	Discipline specific Elective (DSE)	
4	Pre-requisite (if, any)	As per program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to ➤ Basic idea of life building block biomolecules. ➤ Energy status of the cell ➤ Basic carbohydrates, lipids and proteins structure ➤ Biocatalyst enzymes	
6	Credit Value	3 Credits	Credit = 15 Hours - learning & Observation
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40
PART -B: Content of the Course			
Total No. of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours)			
Unit	Topics (Course contents)		No. of Period
I	<ul style="list-style-type: none">Structure of atoms, molecules and chemical bonds.Stabilizing interactions (Van der Waals, electrostatic, hydrogen bonding, hydrophobic interaction, etc.).Principles of biophysical chemistry (pH, buffer, reaction kinetics, thermodynamics, colligative properties)..Composition, structure and function of biomolecules (carbohydrates,).		12
II	<ul style="list-style-type: none">Bioenergetics, glycolysis, oxidative phosphorylation, coupled reaction, group transfer, biological energy transducers.Principles of thermodynamics, free energy and chemical potential, redox reactions, structure and function of ATP.		11
III	<ul style="list-style-type: none">Lipids : structure and function, alpha and beta oxidation and anabolism.Nucleic acids : DNA, RNA, Conformation of nucleic acids (helix (A, B,C, Z), t-RNA, mRNA, rRNA, HnRNA micro-RNA).hoogestein bridge, hairpin DNA		11
IV	<ul style="list-style-type: none">Proteins- amino acids, primary, secondary, tertiary and quaternary structure. Conformation of proteins (Ramachandran plot, secondary structure, domains, motif and folds).Fundamentals of Enzymology: General aspect, classification, nature of enzymes, mode of enzyme action, allosteric mechanism, feedback method of inhibition, regulatory and active sites, isoenzymes, Ribozyme, Abzymes, kinetics of enzymatic catalysis, Michaelis – Menton equation and its significance.		11
Keywords	reaction kinetics, inhibition. active sites, Conformation, ATP		
Signature of Convener & Members (CBos) :			

Biophysical chemistry

Bioenergetics

Lipids

Nucleic acid

Protein

Enzymology

① R. S. Rao
② R. S. Rao
③ R. S. Rao
④ R. S. Rao
⑤ R. S. Rao

⑥ R. S. Rao
⑦ R. S. Rao
⑧ R. S. Rao
⑨ R. S. Rao
⑩ R. S. Rao

Signature of Convener & Members (CBos) :

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books recommended:

1. Galaston, A. W., (1989) Life Processes in Plants. Scientific American Library, Springer- Verlag, New York, USA.
2. Hopkins, W. G. (1995) Introduction to Plant Physiology John Wiley and Sons, Inc. New York, USA.
3. Dennis D. T., Turpin, D. H., Lefebvre D. D. and Layzell, D. B. (1997) Plant Metabolism. Longman, Essex, England.
4. Moore, T. C. (1989) Biochemistry and Physiology of Plant Hormone. Springer Verlag, New York.
5. Nobel, P. S. (1999) Physiochemical and Environmental Plant Physiology. Academic Press, San Diego, USA.
6. Thomas, B. and Vince-Prue (1997) Photoperiodism in Plants. Academic Press, San Diego, USA.

Reference Books Recommended-

1. Taiz, L. and Zeiger, E., (1989) Plant Physiology. Sinauer Associates, Inc. Publishers, Massachusetts, USA.
2. Salisbury F. B. and Ross, C. W., (1992) Plant Physiology Wadsworth Publishing Co., California, USA
3. Lehninger : Principles Of Biochemistry by David L Nelson, Michael M Cox 2021

Online Resources-

> e-Resources / e-books and e-learning portals

1. <https://www.mdpi.com/journal/biomolecules>
2. <https://www.news-medical.net/life-sciences/An-Overview-of-Enzymology.aspx#:~:text=Enzymology%20is%20the%20study%20of,products%20control%20by%20equilibrium%20properties.>
3. [https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book%3AGeneral_Biology_\(Boundless\)/06%3AMetabolism/6.02%3AEnergy_and_Metabolism_-_Types_of_Energy](https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book%3AGeneral_Biology_(Boundless)/06%3AMetabolism/6.02%3AEnergy_and_Metabolism_-_Types_of_Energy)
4. <https://www.thoughtco.com/dna-versus-rna-608191>

Online Resources-

> e-Resources / e-books and e-learning portals

- > www.swayam.ac.in
- > www.ignou.ac.in
- > www.egyankosh.ac.in
- > www.iitm.ac.in
- > www.eskillindia.org
- > www.eshiksha.mp.gov.in
- > www.vlab.co.in
- > www.internshala.com
- > www.ndl.iitkgp.ac.in

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): ~~30~~ Marks 20

End Semester Exam (ESE): ~~70~~ Marks 80

Continuous Internal Assessment (CIA): 30 (By Course Teacher) 20	Internal Test / Quiz: 20 +20/10 Assignment / Seminar - 10 Total Marks - 20 30	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks 20
End Semester Exam (ESE): 70 80	Two section - A & B Section A: Q1. Objective - 10 x1= 10 Mark; Q2. Short answer type- 5x4 =20 Marks Section B: Descriptive answer type qts., 1out of 2 from each unit-4x10=40 Marks	

Name and Signature of Convener & Members of CBoS:

① R. D. S. Rao
② R. D. S. Rao
③ R. D. S. Rao

④ R. D. S. Rao

⑤ R. D. S. Rao
⑥ R. D. S. Rao

⑦ R. D. S. Rao
⑧ R. D. S. Rao
⑨ R. D. S. Rao
⑩ R. D. S. Rao

R. D. S. Rao

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF BOTANY

COURSE CURRICULUM

PART- A: Introduction			
Program: Bachelor in Life Science (Honors)		Semester -VIII	Session: 2025-26 2024-2025
1	Course Code	BOSE 12P 12P	
2	Course Title	Lab. Course -11 P (Biochemistry and enzymology)	
3	Course Type	Laboratory course	
4	Pre-requisite (if, any)	As per program	
5	Course Learning Outcomes (CLO)	<ul style="list-style-type: none"> ➤ Students will be familiar with the common biobuilding block ➤ Biochemical analysis of common biomolecules ➤ Enzyme kinetics and its role ➤ Characterization of light harvesting molecule chlorophyll. 	
6	Credit Value	1 Credits	Credit =30 Hours Laboratory or Field learning/Training
7	Total Marks	Max. Marks: 50	Min Passing Marks: 20
PART -B: Content of the Course			
Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)			
Module	Topics (Course contents)		No. of Period
Lab./Field Training/ Experiment Contents of Course	<ol style="list-style-type: none"> 1) Biochemical test of carbohydrates, sucrose, glucose proteins, lipids 2) Biochemical test of Catalase, dehydrogenase, peroxidase test 3) Preparation of chlorophyll extract 4) Separation of chlorophyll by paper chromatography. 5) Separation of chlorophyll amino acids by paper chromatography. 6) Effect of temperature on enzyme activity 7) Effect of pH on enzyme activity 		30
Keywords	Biochemical test, Catalase, dehydrogenase, chlorophyll, enzyme		

Signature of Convener & Members (CBOS) :

① R. Singh
② R. Singh
③ R. Singh
④ R. Singh
⑤ R. Singh
⑥ R. Singh
⑦ R. Singh
⑧ R. Singh
⑨ R. Singh
⑩ R. Singh

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. Practical Biochemistry by Damodaran Geetha K (Author) Jaypee Brothers Medical Publishers
2. Practical Manual of Biochemistry, CBS Publishers & Distributors Pvt. Ltd. (1 January 2020); CBS Publishers & Distributors Pvt. Ltd.

Reference Books Recommended –

1. Introductory Practical Biochemistry Paperback – 2 January 2001 by S.K. Sawhney (Editor), R. Singh (Editor) Narosa Publishing House
2. Practical Enzymology Author(s): Prof. Dr. Hans Bisswanger First published: 23 February 2011 Print ISBN: 9783527320769 | Online ISBN: 9783527659227 | DOI: 10.1002/9783527659227 Copyright © 2011 Wiley-VCH Verlag GmbH & Co. KGaA

Online Resources–

➤ e-Resources / e-books and e-learning portals

- 1) https://www.amazon.in/s/ref=dp_byline_sr_book_1?ie=UTF8&field-author=KAUSHIK+G+G&search-alias=stripbooks
- 2) https://efaidnbmnnnibpcajpcgclefindmkaj/https://www.mlsu.ac.in/econtents/1616_Biochemical%20Tests%20of%20Carbohydrate,%20protein,%20lipids%20and%20salivary%20amylase.pdf
- 3) <https://alevelbiology.co.uk/notes/tests-for-carbohydrates/>
- 4) <https://alevelbiology.co.uk/notes/test-for-proteins/>
- 5) <https://studymind.co.uk/notes/test-for-lipids-and-proteins/>
- 6) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4121948/>

Online Resources–

➤ e-Resources / e-books and e-learning portals

- www.swayam.ac.in
- www.ignou.ac.in
- www.egyankosh.ac.in
- www.iitm.ac.in
- www.eskillindia.org
- www.eshiksha.mp.gov.in
- www.vlab.co.in
- www.internshala.com
- www.ndl.iitkgp.ac.in

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

Continuous Internal Assessment (CIA): 15 Marks 10

End Semester Exam (ESE): 35 Marks 40

Continuous Internal Assessment (CIA): 15 (By Course Teacher) 10	Internal Test / Quiz-(2): 10 & 10/5 Assignment/Seminar + Attendance - 05 Total Marks - 10+5	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks 10
---	---	--

End Semester Exam (ESE): 35 40	Laboratory / Field Skill Performance: On spot Assessment A. Performed the Task based on lab. work - 20 Marks B. Spotting based on tools & technology (written) - 10 Marks C. Viva-voce (based on principle/technology) - 05 Marks	Managed by Course teacher as per lab. status
--------------------------------	--	--

Name and Signature of Convener & Members of CBOs:

① R. Singh
② R. Kumar
③ M. Singh

④ Dr. S. S. S. S. S.
⑤ Dr. S. S. S. S. S.
⑥ Dr. S. S. S. S. S.
⑦ Dr. S. S. S. S. S.

⑧ Dr. S. S. S. S. S. 05 marks
⑨ Dr. S. S. S. S. S.
⑩ Dr. S. S. S. S. S.

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF BOTANY

COURSE CURRICULUM

PART- A: Introduction			
Program: Bachelor in Life Science (Honors)		Semester - VIII	Session: 2024-2025 2025-26
1	Course Code	BOSE- 12 T Genetic	
2	Course Title	Bioinformatics and Gene Technology	
3	Course Type	Discipline specific Elective (DSE)	
4	Pre-requisite (if, any)	As per program	
5	Course Learning Outcomes (CLO)	At the end of the course, the students will be able : ➤ Understand basics of bioinformatics and it's tools. ➤ Learn application of bioinformatics in various areas. ➤ Analyse and perform RAPD,RFLP,PCR etc. ➤ Understand GMO and ethics behind the cloning.	
6	Credit Value	3 Credits	Credit = 15 Hours - learning & Observation
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40
PART -B: Content of the Course			
Total No. of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours)			
Unit	Topics (Course contents)		No. of Period
I	Introduction to Bioinformatics: Introduction, Branches of Bioinformatics, Aim, Scope and Research areas of Bioinformatics. Biological Databases, Basic biomolecular concepts: Protein, and amino acid, DNA & RNA, Sequence Classification format of Biological Databases.. National Center for Biotechnology Information (NCBI), Examples of related tools (FASTA, BLAST, BLAT, RASMOL), databases (GENBANK, Pubmed, PDB .		12
II	Applications of Bioinformatics : Structural Bioinformatics in Drug Discovery, Quantitative structure-activity relationship (QSAR) techniques in Drug Design, Microbial genome applications, protein sequencing, gene sequencing, Crop improvement.		11
III	Genetic technology : Recombinant DNA technology; restriction endonuclease, cloning vectors. Blotting techniques: Northern, Southern and Western Blotting, DNA Fingerprinting; Molecular DNA markers i.e. RAPD, RFLP. DNA sequencing, PCR and Reverse Transcriptase-PCR.		11
IV	Application of genetic technology: Genetically modified organism; bt cotton and bt brinjal. Transgenic crop; Golden rice. Agrobacterium transformation, Hybridoma and monoclonal antibodies, ELISA and Immunodetection. Molecular diagnosis of human disease, Human gene Therapy, social, legal and ethical aspect of cloning.		11
Keywords Bioinformatics, Drug design, Crop improvement, ELISA			

Signature of Convener & Members (CBOS) :

① R. D. S. S.
 ② R. D. S. S.
 ③ R. D. S. S.
 ④ R. D. S. S.
 ⑤ R. D. S. S.
 ⑥ R. D. S. S.
 ⑦ R. D. S. S.
 ⑧ R. D. S. S.
 ⑨ R. D. S. S.
 ⑩ R. D. S. S.
 ⑪ R. D. S. S.
 ⑫ R. D. S. S.
 ⑬ R. D. S. S.
 ⑭ R. D. S. S.
 ⑮ R. D. S. S.
 ⑯ R. D. S. S.
 ⑰ R. D. S. S.
 ⑱ R. D. S. S.
 ⑲ R. D. S. S.
 ⑳ R. D. S. S.
 ㉑ R. D. S. S.
 ㉒ R. D. S. S.
 ㉓ R. D. S. S.
 ㉔ R. D. S. S.
 ㉕ R. D. S. S.
 ㉖ R. D. S. S.
 ㉗ R. D. S. S.
 ㉘ R. D. S. S.
 ㉙ R. D. S. S.
 ㉚ R. D. S. S.
 ㉛ R. D. S. S.
 ㉜ R. D. S. S.
 ㉝ R. D. S. S.
 ㉞ R. D. S. S.
 ㉟ R. D. S. S.
 ㊱ R. D. S. S.
 ㊲ R. D. S. S.
 ㊳ R. D. S. S.
 ㊴ R. D. S. S.
 ㊵ R. D. S. S.
 ㊶ R. D. S. S.
 ㊷ R. D. S. S.
 ㊸ R. D. S. S.
 ㊹ R. D. S. S.
 ㊺ R. D. S. S.
 ㊻ R. D. S. S.
 ㊼ R. D. S. S.
 ㊽ R. D. S. S.
 ㊾ R. D. S. S.
 ㊿ R. D. S. S.

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

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

Reference Books Recommended –

1. Mount D., Bioinformatics: Sequence and Genome Analysis. Cold Spring Harbor Laboratory Press, New York. (2004).
2. Baxevanis, A.D. and Francis Ouellette, B.F., Bioinformatics- A Practical Guide to the Analysis of Genes and Proteins. Wiley India Pvt Ltd. (2009).
3. Ghosh Z. and Bibekand M. (2008) Bioinformatics: Principles and Applications. Oxford University Press.
4. Pevsner J. (2009) Bioinformatics and Functional Genomics. II Edition. Wiley- Blackwell.
5. Campbell A. M., Heyer L. J. (2006) Discovering Genomics, Proteomics and Bioinformatics. II Edition. Benjamin Cummings.

Online Resources–

> e-Resources / e-books and e-learning portals

- <https://pubmed.ncbi.nlm.nih.gov/24272431/#:~:text=Bioinformatics%20is%20an%20interdisciplinary%20field,a%20computational%20point%20of%20view.>
- <https://byjus.com/biology/bioinformatics/>
- [https://www.lkouniv.ac.in/site/writereaddata/siteContent/202003291612341467kuaum_vadav_Bioinformatics.p](https://www.lkouniv.ac.in/site/writereaddata/siteContent/202003291612341467kuaum_vadav_Bioinformatics.pdf)
- <https://www.gecksforged.org/types-of-biological-database-in-bioinformatics/>
- <https://www.umass.edu/microbio/rasmol/techintr.htm#:~:text=RasMol%20is%20a%20molecular%20graphics,generation%20of%20publication%20quality%20images.>
- <https://www.intechopen.com/chapters/88596>
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9696050/#:~:text=Bioinformatics%2C%20next%2Dgeneration,n%20sequencing%2C,improving%20crop%20quality%20%5B87%5D.>
- <https://www.enzylifesciences.com/science-center/technotes/2017/march/what-are-the-differences-between-pcr-rt-pcr-qpcr-and-rt-qpcr/>
- <https://education.nationalgeographic.org/resource/genetically-modified-organisms/>

Online Resources–

> e-Resources / e-books and e-learning portals

- > www.swavam.ac.in
- > www.ignou.ac.in
- > www.egyankosh.ac.in
- > www.iitm.ac.in
- > www.eskillindia.org
- > www.eshiksha.mp.gov.in
- > www.vlab.co.in
- > www.internshala.com
- > www.ndl.iitkgp.ac.in

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks 20

End Semester Exam (ESE): 70 Marks 80

Continuous Internal Assessment (CIA): 30 (By Course Teacher) 20	Internal Test / Quiz-(2): 20 +20/10 Assignment / Seminar - 10 Total Marks - 20 30	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks 20
---	---	--

End Semester Exam (ESE): 70 80	Two section – A & B Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 =20 Marks Section B: Descriptive answer type qts., 1out of 2 from each unit-4x10=40 Marks
--------------------------------	---

Name and Signature of Convener & Members of CBOS:

① R.P. Rao
② P. Ramesh
③ M. S. Srinivasan
④ G. S. Srinivasan
⑤ K. S. Srinivasan
⑥ P. S. Srinivasan
⑦ A. S. Srinivasan
⑧ S. S. Srinivasan
⑨ M. S. Srinivasan
⑩ M. S. Srinivasan

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF BOTANY

COURSE CURRICULUM

PART- A: Introduction			
Program: Bachelor in Life Science (Honours)		Semester - VIII	Session: 2024-2025 2025-26
1	Course Code	BOSE -12 P	
2	Course Title	Lab. Course -12 (Bioinformatics and Gene Technology)	
3	Course Type	Laboratory course	
4	Pre-requisite (if, any)	As per program	
5	Course Learning Outcomes (CLO)	At the end of this course, students will be able to: <ul style="list-style-type: none"> ➤ Retrieve gene and protein from gene bank. ➤ Understand steps of production of GMO. ➤ Learn the isolation of plasmid DNA. ➤ Understand use and application of PCR. 	
6	Credit Value	1 Credits	Credit =30 Hours Laboratory or Field learning/Training
7	Total Marks	Max. Marks: 50	Min Passing Marks: 20
PART -B: Content of the Course			
Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)			
Module	Topics (Course contents)		No. of Period
Lab./Field Training/ Experiment Contents of Course	<ul style="list-style-type: none"> Retrieve the gene from Gene bank and to save the sequence in FASTA format. Retrieve the protein from Gene bank and to save the sequence in FASTA format. Find the similarity of sequence for the given nucleotide or protein sequence. Find the similarity of sequence for the given protein sequence. Study of steps of genetic engineering for production of Bt cotton, Golden rice through photographs. Study of methods of gene transfer through photographs: Agrobacterium-mediated, direct gene transfer by electroporation, microinjection, micro projectile, bombardment. Isolation of plasmid DNA. Restriction digestion and gel electrophoresis of plasmid DNA. Demonstration of PCR. 		30
Keywords	Gene bank , FASTA, Agrobacterium, PCR		

Signature of Convener & Members (CBoS) :

① Prasanna
 ② Prasanna
 ③ Prasanna
 ④ Prasanna
 ⑤ Prasanna
 ⑥ Prasanna
 ⑦ Prasanna
 ⑧ Prasanna
 ⑨ Prasanna
 ⑩ Prasanna
 ⑪ Prasanna
 ⑫ Prasanna
 ⑬ Prasanna
 ⑭ Prasanna
 ⑮ Prasanna
 ⑯ Prasanna
 ⑰ Prasanna
 ⑱ Prasanna
 ⑲ Prasanna
 ⑳ Prasanna
 ㉑ Prasanna
 ㉒ Prasanna
 ㉓ Prasanna
 ㉔ Prasanna
 ㉕ Prasanna
 ㉖ Prasanna
 ㉗ Prasanna
 ㉘ Prasanna
 ㉙ Prasanna
 ㉚ Prasanna
 ㉛ Prasanna
 ㉜ Prasanna
 ㉝ Prasanna
 ㉞ Prasanna
 ㉟ Prasanna
 ㊱ Prasanna
 ㊲ Prasanna
 ㊳ Prasanna
 ㊴ Prasanna
 ㊵ Prasanna
 ㊶ Prasanna
 ㊷ Prasanna
 ㊸ Prasanna
 ㊹ Prasanna
 ㊺ Prasanna
 ㊻ Prasanna
 ㊼ Prasanna
 ㊽ Prasanna
 ㊾ Prasanna
 ㊿ Prasanna

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. Stewart, C.N. Jr. (2008). Plant Biotechnology & Genetics: Principles, Techniques and Applications. John Wiley & Sons Inc. U.S.A
2. Glick, B.R., Pasternak, J.J. (2003). Molecular Biotechnology- Principles and Applications of recombinant DNA. ASM Press, Washington.
3. Baxevanis, A.D. and Francis Ouellette, B.F., Bioinformatics- A Practical Guide to the Analysis of Genes and Proteins. Wiley India Pvt Ltd. (2009).
4. Ghosh Z. and Bibekanand M. (2008) Bioinformatics: Principles and Applications. Oxford University Press.

Reference Books Recommended –

1. Sarma, P V G K, 2021. A Practical Textbook of Genetic Engineering in Bacteria .
2. Yves Tourte, 2003 . Genetically Modified Organisms Transgenesis in Plants

Online Resources–

➤ e-Resources / e-books and e-learning portals

- <https://vvvcollege.org/dbt/LabManual-Bioinformatics.pdf>
- https://webstor.srmist.edu.in/web_assets/srm_mainsite/files/files/BI0505%20LAB%20MANUAL.pdf
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7712542/#:~:text=Transfer%20the%20supernatant%20that%20contains,the%20purity%20of%20the%20DNA.>
- <https://miteshshrestha.wordpress.com/wp-content/uploads/2018/03/flavr-savr-tomato-golden-rice-bt-cotton.pdf>
- [https://www.deshbandhucollege.ac.in/pdf/resources/1589512616_Z\(H\)-VI-Biotech-1.pdf](https://www.deshbandhucollege.ac.in/pdf/resources/1589512616_Z(H)-VI-Biotech-1.pdf)
- https://bio.libretexts.org/Bookshelves/Biotechnology/Lab_Manual%3A_Introduction_to_Biotechnology/01%3A_Techniques/1.12%3A_Restriction_Digest_with_Gel_Electrophoresis
- <https://www.youtube.com/watch?v=matsiHSuoOw>

Online Resources–

➤ e-Resources / e-books and e-learning portals

- www.swayam.ac.in
- www.ignou.ac.in
- www.cgyankosh.ac.in
- www.iit.ac.in
- www.eskillindia.org
- www.cshiksha.mp.gov.in
- www.vlab.co.in
- www.internshala.com
- www.ndl.iitkgp.ac.in

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

Continuous Internal Assessment (CIA): 15 Marks 10

End Semester Exam (ESE): 35 Marks 40

Continuous Internal Assessment (CIA): 15	Internal Test / Quiz-(2): 10 & 10	5	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
(By Course Teacher) 10	Assignment/Seminar + Attendance - 05		
	Total Marks -	10 15	

End Semester Exam (ESE): 35 40

Laboratory / Field Skill Performance: On spot Assessment

A. Performed the Task based on lab. work - 20 Marks

B. Spotting based on tools & technology (written) - 10 Marks

C. Viva-voce (based on principle/technology) - 05 Marks

Managed by Course teacher as per lab. status

D. Sessional

- 05 Marks

Name and Signature of Convener & Members of CBOS:

① R. Bhowmik
② M. Kundu
③ M. Kundu
M. Kundu

④ A. Das
⑤ A. Das
⑥ A. Das

⑦ A. Das
⑧ A. Das
⑨ A. Das
⑩ A. Das

A. Das

A. Das

FYUGP, HONOURS WITH RESEARCH

(Students who scores 7.5 CGPA and above in the first 6 Semesters and wish to Undertake research at the UG level can choose a research stream in the 4th Year)

COURSE TITLE: PROJECT/DISSERTATION

COURSE CREDIT: 12

MM-300

Course Objective and Outcome:

After completion of the course the learners will be able to:

- The course allows the student to explore a narrow topic in greater depth than a traditional module
- The student works with a single supervisor chosen from their departmental faculty, and this individual provides guidance and support throughout the course of the research.
- The aim of the research project is to test the independent research skills students have acquired during their time at college.
- The students learn to do research and present their finding independently.
- The course is very helpful for students who would pursue academics as a career.

COURSE GUIDELINE

- The students undertaking this course shall be allotted a supervisor/ mentor at the beginning of the semester.
- The student shall select a topic for dissertation from any field of related major discipline with help from the supervisor/ mentor
- The work completed within the stipulated time and written in standard academic format shall be submitted at the end of the semester.
- The research outcome of their project work may be published peer- reviewed journal /presented conference/patented.
- The work shall be evaluated on the basis of the written document submitted by the student and a viva-voce conducted on the same.

MARKS DISTRIBUTION:

PROJECT REPORT/DISSERTATION SUBMISSION (External)	-120
PROJECT REPORT/DISSERTATION SUBMISSION (Internal)	-30
SEMINAR PRESENTATION	-50
VIVA-VOCE	-50
PRESENTATION ANY CONFERENCE / PUBLICATION/ COMMUNICATED	-50

Eas *PR*