

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

<b>PART- A: Introduction</b>			
<b>Program: Bachelor in Life Sciences</b> <i>(Honors)</i>		<b>Semester - VIII</b>	<b>Session: 2024-2025</b>
1	Course Code	<b>BOSC –VIII T</b>	
2	Course Title	Molecular biology and Biostatistics	
3	Course Type	Discipline Specific course (DSC)	
4	Pre-requisite (if, any)	<i>As per program</i>	
5	Course Learning Outcomes (CLO)	<ul style="list-style-type: none"> <li>➤ Students should know about cellular and gene regulation to understand genomic functions</li> <li>➤ Understand the concept of ‘one gene one enzyme hypothesis’ along with the molecular mechanism of mutation</li> <li>➤ Students will be familiar with the genetic material DNA structure its role and defects and repairing</li> <li>➤ Students will be familiar with the RNA structure its role</li> <li>➤ Students will be familiar with data handling.</li> </ul>	
6	Credit Value	<b>3 Credits</b>	<i>Credit = 15 Hours - learning &amp; Observation</i>
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40
<b>PART -B: Content of the Course</b>			
Total No. of Teaching–learning Periods (01 Hr. per period) - 45 Periods (45 Hours)			
Unit	Topics (Course contents)		No. of Period
<b>I</b>	<b>Nucleic acids:</b> 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.		<b>12</b>
<b>II</b>	<b>Mutation and DNA repair</b> 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		<b>11</b>
<b>III</b>	<b>Protein synthesis and gene regulation</b> 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.		<b>11</b>
<b>IV</b>	<b>Biostatistics :</b> Graph, central tendency (Mean, median and mode) Standard Deviation, Standard error Chi square test, regression, degree of freedom		<b>11</b>
<i>Keywords</i>	<i>DNA, RNA, protein synthesis, gene regulation, central tendency</i>		
<b>Signature of Convener &amp; Members (CBoS) :</b>			

1. *R. Sivar*
2. *Kumar*
3. *Indira*
4. *M. S.*
5. *H.*

6. *Deep*
7. *Shanti*
8. *Meera*
9. *H.N.*
10. *Sanjay*

## 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.swayam.ac.in](http://www.swayam.ac.in)
- [www.ignou.ac.in](http://www.ignou.ac.in)
- [www.egyankosh.ac.in](http://www.egyankosh.ac.in)
- [www.iitm.ac.in](http://www.iitm.ac.in)
- [www.eskillindia.org](http://www.eskillindia.org)
- [www.eshiksha.mp.gov.in](http://www.eshiksha.mp.gov.in)
- [www.vlab.co.in](http://www.vlab.co.in)
- [www.internshala.com](http://www.internshala.com)
- [www.ndl.iitkgp.ac.in](http://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.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

End Semester Exam (ESE): 70 Marks

Continuous Internal Assessment (CIA): 30 (By Course Teacher)	Internal Test / Quiz-(2): 20 +20	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment / Seminar - 10	
	Total Marks - 30	
End Semester Exam (ESE): 70	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. Prasad  
 ② Anand  
 ③ Anil Kumar  
 ④ M. Anand  
 ⑤ Anand  
 ⑥ Anand  
 ⑦ Anand  
 ⑧ Anand  
 ⑨ Anand  
 ⑩ Anand

**FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)**

**DEPARTMENT OF BOTANY**

**COURSE CURRICULUM**

<b>PART- A: Introduction</b>			
<b>Program: Bachelor in Life Sciences</b> <i>(Honors)</i>		<b>Semester - VIII</b>	<b>Session: 2024-2025</b>
1	Course Code	BOSC -08	
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"> <li>➤ Isolate DNA from plant cell and <i>E.Coli</i>.</li> <li>➤ Learn chimera formation in various plants.</li> <li>➤ Understand the functioning and application of spectrophotometer.</li> <li>➤ Understand the interpretation of data with the help of statistical data.</li> </ul>	
6	Credit Value	1 Credits	Credit =30 Hours Laboratory or Field learning/Training
7	Total Marks	Max. Marks: 50	Min Passing Marks: 20
<b>PART -B: Content of the Course</b>			
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"> <li>➤ Isolation of DNA from plant cells.</li> <li>➤ Quantitative measurement of DNA by Spectrophotometric method.</li> <li>➤ Feulgen or hydrolytic staining of DNA.</li> <li>➤ Chimera formation in Bougainvillea and other ornamental and other different plants.</li> <li>➤ Isolation of plasmid DNA from <i>E. coli</i> .</li> <li>➤ Isolation of <i>Rhizobium</i> from root nodules of leguminous plants.</li> <li>➤ Isolation of <i>Agrobacterium tumifaciens</i> from tumours of dicot plants.</li> <li>➤ Preparation of LB medium and raising <i>E. Coli</i>.</li> <li>➤ DNA estimation by diphenylamine reagent/UV Spectrophotometry.</li> <li>➤ Analysis of statistical data: Statistical tables, Central tendency - mean mode, median, standard deviation and standard error (using seedling population /leaflet size etc).</li> <li>➤ Calculation of correlation coefficient values and finding out the probability.</li> <li>➤ Computer application in biostatistics - MS Excel and SPSS</li> </ul>		30
Keywords	Spectrophotometer, Plasmid, colchicine, <i>E.Coli</i> , Central tendencies.		
Signature of Convener & Members (CBoS) :			

① *R. Divya*  
 ② *Leena*  
 ③ *Madhavi*  
 ④ *M*

⑤ *[Signature]*  
 ⑥ *[Signature]*  
 ⑦ *[Signature]*  
 ⑧ *[Signature]*  
 ⑨ *[Signature]*  
 ⑩ *[Signature]*

## 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](http://www.swayam.ac.in)
- [www.ignou.ac.in](http://www.ignou.ac.in)
- [www.egyankosh.ac.in](http://www.egyankosh.ac.in)
- [www.iitm.ac.in](http://www.iitm.ac.in)
- [www.eskillindia.org](http://www.eskillindia.org)
- [www.eshiksha.mp.gov.in](http://www.eshiksha.mp.gov.in)
- [www.vlab.co.in](http://www.vlab.co.in)
- [www.internshala.com](http://www.internshala.com)
- [www.ndl.iitkgp.ac.in](http://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.k-state.edu/wgrc/electronic_lab/feul_stain_prot.html)
- [https://www.westga.edu/academics/research/vrc/assets/docs/spss\\_basics.pdf](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): 15 Marks

End Semester Exam (ESE): 35 Marks

Continuous Internal Assessment (CIA): 15 (By Course Teacher)	Internal Test / Quiz-(2): 10 & 10	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
	Assignment/Seminar + Attendance - 05 Total Marks - 15	
End Semester Exam (ESE):35	Laboratory / Field Skill Performance: On spot Assessment	Managed by Course teacher as per lab. status
	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	

Name and Signature of Convener & Members of CBoS:

① Biswas  
② Kundu  
③ Mallik  
④ K. S. Das  
⑤  
⑥  
⑦ K  
⑧ G. S. Das  
⑨ B. Das  
⑩ U. S. Das