

**CERTIFICATE COURSE**

**IN**

**BIOINFORATICS**

**Department of Microbiology and  
Bioinformatics**

**Atal Bihari Vajpayee Vishwavidyalaya**

**Bilaspur (C.G.)**

**(A State University, Established by the Government of  
Chhattisgarh)**

## **1. About the University**

Atal Bihari Vajpayee Vishwavidyalaya (ABVV), a State University, established under the Chhattisgarh Act No. 7, 2012, is in existence since June, 2012. The University has affiliation of around 180 government and private colleges covering 5 major districts of the state. The University is catering the education needs of both graduation and post graduation courses of the various streams mainly covering Science, Commerce, Law, Education, and Research Centers.

## **2. About the Course**

The certificate programme in Bioinformatics is recognized qualification provides better understanding on biological concept, applications and analysis of big data from available biological databases. Those completing the course are awarded a CERTIFICATE and will be able to apply this knowledge for solving problems and making decisions associated with the technical and practical applications in *in silico* methods.

## **3. Scope:**

Bioinformatics has a wide scope and opportunities all around the world. Most of the biological data is available in several databases and better understanding of the unknown and complex bigdata is quite complicated by manual methods. The certificate course provides job-oriented knowledge and applications in scientific methods which caters the need of society. Bioinformatics has wide scope in education, software industries, pharmaceuticals, medical, marketing and several platforms in research.

## **4. Outcome of the Course:**

- To impart comprehensive overview of the scientific and technical aspects of Bioinformatics.
- To workout in databases, sequence analysis and drug designing
- To demonstrate several packages and software's available in bioinformatics.

## **5. Eligibility Criteria**

All those who have completed their Senior School Certificate Examination (Class XII) with Mathematics/Biology.

## **6. Fees Structure**

One time registration/tuition fees of Rs. 5000/-

**7. Intake Capacity** – 30 seats

**8. Course Duration** – 6 months/ 24 weeks.

**9. Attendance**

Minimum attendance of 75 % is required in the classes for appearing in the examination.

**10. Examination & Scheme and Concise Course Content**

Programme Structure					
Module 1: Bioinformatics concepts					
Module 2: Basics in Biology					
Module 3: Bioinformatics Resources and Databases					
Module 4: Sequence Analysis					
Module 5: C Programming language					
Module 6: Introduction to Database systems					
Module 7: Drug Designing					
Note: Syllabus Detail is given in Annexure: 1.					
1. COURSE STRUCTURE :					
1.1.	Theory	- The theory syllabus will be updated periodically by the BOS			
1.2.	Practical's-	The practical syllabus will be updated periodically by the BOS.			
1.3.	Assignment/Seminar/Project	– As per the directions of Department.			
S. No.	Papers	Maximum Marks	Minimum Marks	Credits	
1.	Paper I- Theory (Bioinformatics)	100	40	4	
2.	Paper II- Practical (Bioinformatics Lab)	100	40	2	
Total marks		200	80	6	200

**2. EXAMINATION PROCEDURE:**

At the end of course the examination will be conducted. Its notice & time table will be displayed for communication to the students at least before 10 days of the date of examination.

2.1. For successful completion of the program, a participant is required to have a minimum of 75 % attendance. A participant will not be eligible to appear in the term-end practical examinations if the percentage of attendance in practical sessions falls below 75%. He/she can, however, appear for the theory papers. In order to make up deficiency of attendance in practical sessions, the student will be required to attend extra classes (practical) as per directions issued by the University from time to time.

2.2. Theory - The formats may be used for this purpose.

2.2.1. Question Paper will be in English medium.

2.2.2. Examinations shall be of 75 marks which are divided as:

Part A (10 x 2 = 20) MCQs A multiple-choice questionnaire

Part B (10 x 2.5 = 25) Fill in the blanks/very short answer

questions Part C (6 x 5 =30) short/long answer questions

2.2.3. Candidates securing a minimum of 30 marks shall be declared to have secured pass in this section. Time allowed for the examination shall be of a maximum of 2 hours.

2.3. Practical:

2.3.1. Practical Question Paper will be in English medium.

2.3.2. Examinations shall be of 100 marks which is divided as –

Maximum marks: 100      Time: 2 hours

Q1. Practical Exam      = 60 Marks

Q2. Practical manual      = 10 Marks

Q3. Spotting      = 15 Marks

Q4. Viva Voce      = 15 Marks

2.3.3. Candidates securing minimum of 40 marks shall be declared to have passed in this section.

2.4. Assignment/Seminar/Project: Maximum marks: 25

2.4.1. Candidates securing a minimum of 10 marks shall be declared to have secured pass in this section.

2.5. To qualify for the award of certificate, a candidate must pass in all the sections as mentioned in 2.2, 2.3 & 2.4 separately. Those securing 75% and above as total will be declared to have passed with distinction.

2.6. Candidates who have failed and wish to appear again in the examination shall have to appear in both i.e. theory and practical sections irrespective of their performance in various sections in the last examination in which they appeared. Candidates will be given only one chance to re-appear in exam for completion of the certificate course

3. Result: Results will be declared on receipt of the final result sheet from the tabulator, Examination, Atal Bihari Vajpayee Vishwavidyalaya, Bilaspur, Chhattisgarh.

4. Certificate: Certificate shall be awarded to the candidate after successful completion of the course and declaration of the result.

**Note:** Such value added course is also useful in gaining self employability to the students and are also promoted by various national bodies like UGC, AICTE, ICAR etc.

### **Benefits for the University**

- ✓ Revenue Generation
- ✓ Additional Certification Course
- ✓ Value Added Course (Helpful in NAAC)
- ✓ Industry Collaboration (Helpful in AICTE)
- ✓ Entrepreneurial Course (Helpful in NAAC Criteria-I)
- ✓ No extra infrastructural setup required.
- ✓ Possible with the existing workforce.
- ✓ Helpful in getting government projects like DST, DBT, UGC.
- ✓ Can be guided through e-content.
- ✓ Development of e-content for the course (Helpful in AICTE and NAAC Criteria – III).

### **Benefits for the Participants**

- ✓ Professional Certification
- ✓ Job oriented
- ✓ Practical exposure
- ✓ Authenticity of the Course
- ✓ Less fees as compared to other Institutions.

### **Detail Syllabus:**

### **Annexure 1**

**Module 1: Bioinformatics concepts:** Aim and branches of Bioinformatics, Application of Bioinformatics, Role of internet and www in bioinformatics. Basic biomolecular concepts: Protein and amino acid, DNA & RNA, Sequence, structure and function. Forms of biological information, Types of Nucleotide Sequence: Genomic DNA, Complementary DNA (cDNA), Recombinant DNA (rDNA), Expressed sequence tags (ESTs), Genomic survey sequences (GSSs). DNA sequencing methods: Basic and Automated DNA sequencing,

**Module 2: Basics in Biology:** Structure and properties of purine and pyrimidine, two-dimensional structure of DNA, nucleosides, nucleotides, chemical synthesis of oligonucleotides, physicochemical properties of nucleic acids, Models and strategies of DNA replication, DNA damage and repair, DNA editing. Principles of transcription- prokaryotic and eukaryotic, General features of genetic code, structural components of prokaryotic and eukaryotic ribosomes, protein synthesis in prokaryotes and eukaryotes, inhibitors of protein synthesis, post translational modifications, protein targeting.

**Module 3: Bioinformatics Resources and Databases:** NCBI, EBI, ExPASy, RCSB and DDBJ: The knowledge of databases and bioinformatics tools available at these resources, organization of databases: data contents, purpose and utility.

Open access bibliographic resources and literature databases: PubMed, BioMed Central, Public Library of Sciences (PloS), CiteXplore. Nucleic acid sequence databases: GenBank, EMBL, DDBJ; Protein sequence databases: Uniprot-KB: SWISS-PROT, TrEMBL, UniParc; Structure Databases: PDB, NDB, PubChem, ChemBank. Sequence file formats: Various file formats for bio-molecular sequences: GenBank, FASTA, GCG, MSF etc. Protein and nucleic acid properties: Proteomics tools at the ExPASy server, GCG utilities and EMBOSS, Computation of various parameters.

**Module 4: Sequence Analysis:** Basic concepts of sequence similarity, identity and homology, definitions of homologues, orthologues, paralogues and xenologues Scoring matrices: basic concept of a scoring matrix, Matrices for nucleic acid and proteins sequences, PAM and BLOSUM series, matrix derivation methods and principles. Measurement of sequence similarity; Similarity and homology. Pairwise sequence alignment: Basic concepts of sequence alignment, Needleman and Wunsch, Smith and Waterman algorithms for pairwise alignments, gap penalties, use of pairwise alignments for analysis of Nucleic acid and protein sequences and interpretation of results. Multiple sequence alignments

**Module 5: C Programming language:** Introduction to C Programming language, Problem solving Technique: Algorithm, Flowchart, C language Introduction, Tokens, Keywords, Identifier, Variables, Constants, Operators, Expressions, Data types, Operator precedence, Statement: Input statement, Output statement, Conditional and Unconditional Control Statement, Looping Statement: while, do-while, for and nested loops, Arrays, structures, pointers, file handling.

**Module 6: Introduction to Database systems:** Fundamentals of database - Database models (Hierarchical, Network, Relational and Object-Oriented Models) – RDBMS: Relational Database Management systems - Database System Applications and Security.

**Module 7: Drug Designing:** Computer Aided Drug Design (CADD), Pharmacophore properties, Ligand and structure based drug design, Receptors - Structure, function, and pharmacology, Virtual screening. Molecular Docking – Principles and methods for Docking, Docking problem, 3-D database search approaches, Rigid body and flexible docking; Hydropathy, Denovo ligand design.

#### **Suggested References:**

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).

Certificate in Bioinformatics

**Scheme**

<b>Subject</b>	<b>Theory</b>				<b>Practical</b>		<b>Total Marks</b>	<b>Credit s</b>
	External Evaluation TH		Internal Assessment SE		<b>PR</b>			
	Max	Pass Marks	Max	Pass Marks	Max	Pass Marks		
Bioinformatics	75	30	25	10	--	--	100	4
Bioinformatics Lab	--	--	--	--	100	40	100	2

### **BUDGET PLAN FOR THE CERTIFICATE COURSE**

S.No.	Income /course	Amount (in Rupees)
a)	Intake- 30 candidates with course fee 5000 rupees	1,50,000/-
S.No.	Expenditure Detail	Amount (in Rupees)
1.	Instruments and tools (one time)	1,50,000/-
2.	Contingencies	15,000/-
3.	Salary (lab assistant) (5000 Rs/month)	60,000/-
4.	Stationary and printing	10,000/-
5.	TA and Conveyance	10,000/-
6.	Honorarium (5 guest lecturers / course-1000/- per lecture)	5000/-
7.	Total	2,50,000 /-

#### Year wise plan

S.No.	Expenditure Detail	Amount (in Rupees)
1.	For first year	2,50,000 /-
2.	From second year	1,00,000/-