SHRI VAISHNAV INSTITUTE OF MANAGEMENT & SCIENCE, INDORE

(Autonomous)

Approved by AICTE, New Delhi and Affiliated to DAVV, Indore & RGPV, Bhopal, Madhya Pradesh, India UGC-NAAC Accredited 'A' Grade Institute

ISO 9001:2015 Certified

Syllabus

Bachelor of Science (Bioinformatics)

[B. Sc. (BI)]

Year I / Semester I

w.e.f. Session 2025-26

Scheme No. 71, Gumasta Nagar, Indore-452009 Madhya Pradesh, Ph. : 0731-2780011, 2789925

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Shri Vaishnav Institute of Management & Science, Indore				
B.Sc. (Bioinformatics) I Semester				
Session : 2025-26				
S.No.	**Course Type**	**Course Code**	**Subject**	**Total Credit**
1.	Core Course (Major 1) (C-1)	BSCBI-101(T)	Introduction to Bioinformatics (Theory)	4
		BSCBI-101(P)	Introduction to Bioinformatics (Practical)	2
2.	Minor 1 (M-1)	BSCBI-102(T)	Fundamental Organic Chemistry **(**Theory)	2
		BSCBI-102(P)	Fundamental Organic Chemistry **(**Practical)	2
3.	Multidisciplinary Course (MDC)	BSCBI-103(T)	Information Technology (Theory)	2
		BSCBI-103(P)	Information Technology (Practical)	1
4.	Ability Enhancement Course AEC-1	AEC-101	Hindi Language & Sanskriti	2
5.	Skill Enhancement Course SEC (VOC) - I	SEC-101	Digital Marketing	3
6.	Internship/Apprenticeship/Project Work/Community Engagement	PW/ Ap/ CE - 101	Project Work	2
Total Credits				20

PART-A : Introduction				
Programme : B.Sc. (Bioinformatics)		**Class : I Semester**	**Year : I**	**Session : July 2025- June 2026**
Subject : Bioinformatics		**Theory**		
1.	**Course Code**	BSCBI-101(T)		
2.	**Course Title**	**Introduction to Bioinformatics (Theory)**		
3.	**Course Type (Core Course/DSE/Minor/MD-ID/SEC/VOC)**	Major Paper I (Theory)		
4.	**Pre-Requisite (if any)**	To study this course, a student must have Biology and/or Mathematics as one of the subjects in class 12th		
5.	**Course Objectives**	1. To demonstrate different biological database. 2. To apply algorithm for searching biological database. 3. To categorize sequence alignment methods. 4. To implement phylogenetic tree construction methods.		
6.	**Course Outcomes (CO's)**	**Upon successful completion of this course, students will be able to:** CO1.Understand the scope and applications of bioinformatics CO2. Access and retrieve information from various biological databases. CO 3. Perform sequences alignment and interpret the results. CO 4. Construct and interpret phylogenetic trees. CO 5. Apply predictive methods to analyze biological sequences. CO 6. Understand the principles of comparative genomics and structural bioinformatics.		
7.	**Credit Value**	4 Credits		
8.	**Total Marks**	**Max. Marks: 30+70**	**Min. Passing Marks: 35**	

PART-B : Content of the Course		
No. of Lectures per week : 06		
Total No. of Lectures required : 60		
Unit	**Topics**	**No. of Lectures required**
I	**Introduction to Bioinformatics and Biological Databases** • Introduction to Bioinformatics: Definition, scope, applications in various fields of biology, and the interdisciplinary nature of Bioinformatics. Application oriented background of bioinformatics. • Introduction to Biological Databases: Types of databases (Nucleic acid, protein, genome, specialized), database organization, data submission and retrieval. Structure and classification of biological databases. • Nucleic Acid Databases: GenBank, EMBL, DDBJ • Protein Databases: UniprotKB/Swiss-Prot, PIR, PDB, Specialized Genome Databases • Indian Biological Databases. Activity: Explore different biological databases (GenBank, UniProt, PDB), compare their content and search features. Keywords: Bioinformatics, biological databases, nucleic acid databases, protein databases, genome databases, data retrieval, database types.	**12**
II	**Data Acquisition and Information Retrieval** • Data Acquisition: Concepts, purposes and methods of data acquisition in bioinformatics • Information Retrieval: Integrated information retrieval systems (e.g. Entrez). Retrieving database entries using different search strategies. • The NCBI Data Model: Introduction, Seq-ID, sequences data, sequence collections, sequences annotations and describing sequence data. • GenBank Sequence Database: Structure, primary and secondary databases, format vs. content (computer vs, human readability), GenBank flat file format, GCG format **Activity:** Use Entrez to answer specific biological questions, focusing on effective search strategies	**12**

	Keywords: Data acquisition, information retrieval, Entrez, NCBI data model, Seq-ID, sequence annotation, GenBank, flat file format, GCG	
III	**Sequence Alignment and Database Searching** • Sequence Alignment: Introduction, evolutionary basis of sequence alignment, optimal alignment methods (e.g., Needleman Wunsch, Smith-Waterman), scoring matrices (e.g., PAM, BLOSUM), gap penalties, statistical significance of alignments. • Database Similarity Searching: FASTA, BLAST algorithms and their variants, database searching artifacts. • Position –Specific Scoring Matrices (PSSM): Construction and applications. **Activity:** Use BLAST to identify homologs of an unknown sequiece and interpret the results**.** **Keywords:** Sequence alignment, database searching, FASTA, BLAST, scoring matrices, gap penalties, PSSM	**12**
IV	**Multiple Sequence Alignment and Phylogenetic Analysis** • Multiple Sequence Alignment (MSA): Introduction, structural vs. Evolutionary alignment, methods for MSA (e.g. Clustal W,MUSCLE, T-Coffee) • Phylogenetic Analysis: Fundamentals of phylogenetic models, tree interpretation (paralogues, orthologues), tree building methods (e.g. UPGMA, Neighbor Joining, Maximum Parsimony, Maximum Likelihood), tree evaluation (e.g., bootstrapping) • Phylogenetic Software: Example (e.g., PHYLIP, MEGA) **Activity:** Construct phylogenetic trees from given sequences using any software and interpret the evolutionary relationships**.** **Keywords:** Multiple sequence alignment, MSA, phylogenetic analysis, phylogenetic tree, paralogues, orthologues, tree building methods., bootstrapping	**12**

V	**Predictive Methods, Structural Bioinformatics And Comparative Genomics** • Predictive Methods using Nucleotide Sequences: Identifying repetitive DNA, database searches, codon bias detection, detecting functional sites in DNA • Predictive methods using Protein Sequences: Protein Identification based on composition, physical properties based on sequences, motifs and patterns secondary structure prediction, folding classes, specialized structure or features, tertiary structure prediction. • Structural Bioinformatics: Introduction to Protein structure, PDB and MDB databases, structure file formats, visualizing structure information(structure viewers), similarity searching, advanced structure modeling • Comparative Genome Analysis: Introduction, applications, genome analysis and annotation, comparative genome tools. **Activity:** Predict protein structure using online tools analyze the structure using visualization software **Keywords:** Predictive methods, nucleotide sequence analysis, protein sequence analysis, structural bioinformatics, PDB, MMDB, comparative genomics, genome annotation.	**12**

Part – C : Learning Resources
Textbooks, Reference Books, Other Resources
Suggested Readings: 1. Bioinformatics, Andreas D. Baxevanis, David S. Wishart, Gray D. Bade, Wiley, United Kingdom, 2019. 2. Essential Bioinformatics, Xiong Jin, Cambridge University Press, United States, 2014 3. Bioinformatics: Sequence and Genome Analysis, Mount, D.W., CBS Publishers and Distributors, India, 2005. 4. Introduction to Bioinformatics, Lesk, Arthur M, Oxford University Press, USA, 2019. 5th edition 5. Bioinformatics: methods and applications(Genomics, proteomics and Drug Discovery), Mendiratta, N., Rastogi,P., Rastogi, S.C., PHI Learning, India,(2013) 6. Bioinformatics: Principle s and applications, Ghosh, Z., Mallik, B., Oxford Press, New Delhi, India,2012. 7. Bioinformatics and Functional Genomics, Pevsner, Jonathan, Wiley, United Kingdom, 2015, 3rd edition.
Suggested equivalent online courses: 1. NPTEL: Biotechnology-NOC: Bioinformatics: Algorithms and Applications 2. Bio-Informatics-IITM-YouTube

Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods: Maximum Marks: 100 Marks Continuous Comprehensive Evaluation (CCE): 30 Marks University Exam (UE): 70 Marks		
Internal Assessment Continuous Comprehensive Evaluation (CCE)		**Total Marks :** 30
External Assessment Time: 03.00 hours.	**Section (A)** : Very Short Questions **Section (B)** : Short Questions **Section (C)** : Long Questions	**Total Marks :** 70
Total Marks	**(Internal Assessment + External Assessment) :** 30+70	
Credit Value	4	
Minimum Passing Marks	35	

Part A Introduction			
Programme : B.Sc. (Bioinformatics)	**Class : I Semester**	**Year : I**	**Session : July 2025- June 2026**
Subject: Bioinformatics		**Practical**	

1	**Course Code**	BSCBI-101(P)
2	**Course Title**	**Introduction to Bioinformatics**
3	**Course Type**	**Major Paper I (Practical)**
4	**Pre-requisite (if any)**	To study this course, a student must have Biology and/or Mathematics as one of the subjects in class 12th
5	**Course Objectives**	1. To introduce students to the DNA/Protein sequences from databases 2. To enhance knowledge on multiple sequence alignment using bioinformatics tools. 3. To enable them learn advanced Visualize the structures of proteins
6	**Course Outcomes (CO's)**	**Upon successful completion of this course, students will be able to:** CO1. Retrieve the DNA/Protein sequences from databases and analyze them using bioinformatics tools. CO2: Perform multiple sequence alignment using bioinformatics tools. CO 3: Visualize the structures of proteins**.**
7	**Credit Value**	2 Credits
8	**Total Marks**	**Max Marks: 100 , Min Passing Marks=35**

Part B- Content of the Course

No. of Lectures per week : 03

Total No. of Lectures required : 30

Practical	**Topics**	**No.of Lectures)**
	1. Introduction to NCBI. 2. Using Entrez to search Literature Databases. 3. Retrieving DNA sequence from GenBank and analyzing various formats of the data stored. 4. Retrieving Protein sequence from GenPept (NCBI) and Expasy. 5. Analyzing Protein Sequences. 6. Analyzing DNA Sequences. 7. Sequence Alignment using BLAST(Basic Local Alignment Search Tool)Sequences alignment using FASTA.	**30**

	8. Multiple sequence alignment using ClustalW. 9. Introduction to the structure database PDB 10. Visualization of the protein structure using VMD. 11. Secondary structure prediction using GOR algorithm.	

Part C-Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings:

1. Bioinformatics, Andreas D. Baxevanis, David S. Wishart, Gray D. Bade, Wiley, United Kingdom, 2019.
2. Essential Bioinformatics, Xiong Jin, Cambridge University Press, United States, 2014
3. Bioinformatics: Sequence and Genome Analysis, Mount, D.W., CBS Publishers and Distributors, India, 2005.
4. Introduction to Bioinformatics, Lesk, Arthur M, Oxford University Press, USA, 2019. 5th edition
5. Bioinformatics: methods and applications(Genomics, proteomics and Drug Discovery), Mendiratta, N., Rastogi,P., Rastogi, S.C., PHI Learning, India,(2013)
6. Bioinformatics: Principle s and applications, Ghosh , Z., Mallik, B., Oxford Press, New Delhi, India,2012.
7. Bioinformatics and Functional Genomics, Pevsner, Jonathan, Wiley, United Kingdom, 2015, 3rd edition.

Suggested equivalent online courses:

1. NPTEL: Biotechnology-NOC: Bioinformatics: Algorithms and Applications
2. Bio-Informatics-IITM-YouTube

Part D- Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Internal Assessment	Marks	External Assessment	Marks
Class Interaction/Quiz	30	Viva Voce on Practical	70
Attendance		Practical Record File	
Assignments (Charts/Model Seminar/Rural Service/Technology/Dissemination/Report of Excrusion/Lab Visits/Survey/Industrial visit)		Table work/Experiments	
Total Marks: 100			

Part A : Introduction			
Programme : B.Sc. (Bioinformatics)	**Class : I Semester**	**Year : I**	**Session : July 2025- June 2026**
Subject: Chemistry		**Theory**	

1	**Course Code**	BSCBI-102(T)	
2	**Course Title**	Fundamental Organic Chemistry	
3	**Course Type (Core Minor 1 Course/Elective/Generic Elective/Vocational....)**	Minor 1	
4	**Pre-requisite (if any)**	To study this course the students must have the subject Chemistry in 12th Course or equivalent	
5	**Course Objective**	To enable students to understand and apply fundamental concepts of organic chemistry and traditional Indian knowledge of chemistry, specifically in the areas of: 1. Understanding traditional Indian chemistry: Familiarize students with Bharatiya Traditional Knowledge of Chemistry in the post-Vedic period. 2. Organic chemistry fundamentals: Develop students' understanding of structure, bonding, and mechanisms in organic molecules. 3. Stereochemistry and reaction mechanisms: Equip students with knowledge of stereochemistry and mechanisms of various organic reactions 4. Hydrocarbon chemistry: Enable students to explain the preparation, properties, and structures of alkanes, cycloalkanes, alkenes, and alkynes.	
6	**Course Outcomes (CO's)**	After completing this course, the student will be able to - CO1: Explain Bharatiya Traditional Knowledge of Chemistry in Post vedic period CO2: Explain Structure and bonding in organic Molecules. CO3: Explain Mechanism of different organic Reactions. CO4: Explain Stereochemistry of organic compounds. CO5: Explain preparation properties and structures of alkanes, cycloalkanes, alkenes and alkynes.	
7	**Credit Value**	3 Credits	
8	**Total Marks**	Max. Marks: 30+70	Min. Passing Marks: 35

Part B Content of the Course		
No. of Lectures per week : 3		
Total No of Lecture Required: 45		
Unit	**Topic**	**No. of Lectures**
1	**Bharatiya Traditional Knowledge of Chemistry in Post vedic period** Samkhya, Bhratsamhita, Nyaya and Vaisesikha of Varahmihira, Sushrut sahinta, Rasashala, tradition of chemicals in Time of Charak and Sushrut. Sankhya-Patanjali System, Evolution of Different forms of Matter from the Vedantic view, The Atomic theory of the Buddhists and Jains. Keyword/tags: Samkhya, Bhratsamhita, Arthasastra of Kautilya, Nyaya and Vaisesikha of Varahmihira, Sushrut sahinta, Buddhists and Jains. **Activities:** 1. Gather information about traditional Indian cosmetics knowledge and traditional Indian drug knowledge. 2. Prepare the Project and Modals related to Ancient Indian Chemistry. 3. Field study of BKS in nearby area.	9
2	**Structure and bonding-** Hybridization, shapes of methane, ethane, ethylene, and acetylene. Vander wall interaction, electronic displacement- mesomeric effect, resonance, hyperconjugation, aromaticity, inductive effect. Hydrogen bonding in organic compounds with the special reference to alcohol, phenols, amines and its consequences, dipole moment, organic acids and bases, their relative strength with emphasis on factors affecting pka value. **Keyword/tags:** Hybridization, Vanderwall interaction, electronic displacement, dipole moment	9
3	**Mechanism of organic reactions** homolytic and heterolytic bond fission with suitable examples, types of reagents-electrophiles and nucleophiles, types of reactions and their mechanism-addition elimination and substitution, types, shapes and relative stabilities of reactive intermediates- carbocation, carbanion, free radicals, carbenes, nitrenes. Keyword/tags: homolytic and heterolytic bond fission, electrophiles and nucleophiles.	9

4	**Stereochemistry of organic compounds-** Concept of isomerism, types of isomerism, structural isomerism, stereo isomerism, optical isomerism, elements of symmetry, molecular chirality, enantiomers, optical activity, example of optical isomerism, chiral and achiral molecules, diastereo isomers, threo and erythro isomers, resolution of enantiomers, inversion and retention, geometrical isomerism, E-Z nomenclature, confirmational isomerism, Newman projection, Sawhorse projection, Flying wedge formula, Fischer projection, confirmation of ethane, butane and cyclohexane Keyword/tags: isomerismn, stereo isomerism, optical isomerism, elements of symmetry	9
5	**Alkanes-** Open chain and close chain compounds, functional groups, homologous series, classification of aliphatic compounds, nomenclature of aliphatic compounds, IUPAC nomenclature of alkanes, isomerism in alkanes, methods of synthesis -Wurtz synthesis, Kolbe synthesis, Grignard reagent, physical and chemical properties. **Cycloalkanes-** nomenclature, Bayer strain theory, relative stability of rings, concept of strainless rings. **Alkenes-** nomenclature, methods of preparation: dehydration of alcohols, dehydrohalogenation of alkyl halides, Saytzeff rule, Hofmann rule, properties of alkene: addition of halogen (electrophilic, free radical, Markovnikov rule), ozonization, polymerization **Alkynes-** nomenclature, methods of preparation, structure, chemical reactions: electrophilic addition, nucleophilic addition, 0zonisation, oxidation, acidic nature, polymerization and isomerisation. Keyword/tags: functional groups, homologous series, IUPAC nomenclature	9
	Activities	
	Extraction of Tulsi, Neem, Amla, Haldi Gather data on the processes used to purify zinc both historically and currently. Gather images and records pertaining to the history of two rust- resistant monuments built in India. Gather information about traditional Indian cosmetics knowledge and traditional Indian drug knowledge. Collection of Medicinal plants and their uses from nearby area (Herbarium Preparation) Chart preparation of Ancient Indian Scientist in Chemistry and their contribution. Field study of BKS in nearby area Educational Tour of Industries and Research Institutes Prepare the Project and Modals related to Ancient Indian	

Part C – Learning Resources
Text Books, References Books, Other resources

Suggested Readings:

1. History of Chemistry in ancient and Medieval India: Incorporating the History of Hindu Chemistry, 2014 by Ray Prafulla Charndra Acharya, ISBN-10 8121801540, Publisher Chowkhamba Krishnadas Academy
2. Chemistry and Chemical Techniques in India, Author: B. V. Subbarayappa, Publisher: Centre For Studies In Civilizations, Edition:2004, ISBN:818758601X
3. Chemistry and Chemical Techniques in India: Vol 4 Part 1 (History of Science, Philosophy and Culture in Indian Civilization) 1 January 1999, by B. V. Subbarayappa (Editor), ISBN-10 818758601X, Publisher Centre for Studies in Civilisations
4. Dinesh Atomic Structure, Bonding, General Organic Chemistry & Aliphatic Hydrocarbons for B.Sc. – I (CHEM 101TH) 1 January 2020 by P.N.Kapil (Author), Publisher S. Dinesh & Co.
5. Structure and Bonding, Steven Farmer & Dietmar Kennepohl University of Illinois Springfield, Libre text chemistry,
6. Basics of Organic Chemistry A Textbook for Undergraduate Students, Author: Anshul Bansal, ISBN: 978- 981-5223-23-1 (Print) ISBN: 978-981-5223-22-4 (Online) Year of Publication: 2024
7. March's Advanced Organic Chemistry: Reactions, Mechanisms, and Structure, 8th Edition, Michael B. Smith, ISBN: 978-1-119-37180-9. March 2020, Wiley
8. Modern Methods of Organic Synthesis (4th Edition) 4th Edition, by W. Carruthers (Author), lain Coldham (Author), ISBN-10 0521778301, Publisher Cambridge University Press
9. Reaction Mechanism In Organic Chemistry Paperback 28 June 2016, by Subrata Sen Gupta (Author), SBN-10 019945681X, Publisher Oxford University Press
10. Stereochemistry of Organic Compounds Hardcover -6 September 1994, by Ernest L. Eliel (Author), Samuel H. Wilen (Author), ISBN-10 0471016705, Publisher Wiley-Interscience, Edition 1
11. Nasipuri D_Stereochemistry Of 4ed (499) by D. Nasipuri |1 October 2020, Stereochemistry of Organic Compounds: Principles and Applications by D. Nasipuri | 7 January 2018, Newage International pvt, Itd
12. Stereochemistry of Organic Compounds, Ernest L. Eliel, Samuel H. Wilen, Lewis N. Mander, Wiley, 28 Sept 1994
13. Organic Chemistry: Hydrocarbons Hardcover -1 December 2007 by Dr M S Yadav (Author), ISBN-10 8189741365, Publisher SBS Publishers
14. Hydrocarbons (Alkanes, Alkenes And Alkynes), Amit Arora, Discovery Publishing House, 2006
15. Textbook of Organic Chemistry (LPSPE) Author : Arun Bahl & BS Bahl ISBN : 9789352837304 S Chand Publishing year: 2019

Suggested equivalent online courses

1. Organic Chemistry-I By Dr. B. S. Balaji Jawaharlal Nehru University, New Delhi https://onlinecourses.swayam2.ac.in/ugc19 ch01/preview
2. Introductory Organic Chemistry I By Prof. Neeraja Dashaputre, Prof. Harinath Chakrapani | ISER Pune https://onlinecourses.nptel.ac,in/noc20 cy30/preview

Part D-Assessment and Evaluation		
Suggested Continuous Evaluation Methods Maximum Marks: 100 Continuous Comprehensive Evaluation (CCE) : 30 marks University Exam (UE) 70 marks		
Internal Assessment: Continuous Comprehensive Evaluation (CCE): 30	Class Test Assignment/Presentation	30
External Assessment :	**Section(A)** : Very Short Questions **Section (B)** : Short Questions **Section (C)**: Long Questions	70
Total Marks	**(Internal Assessment + External Assessment) :**	
Credit Value	3 Credits	
Minimum Passing Marks	35	

Part A : Introduction				
Programme : B.Sc. (Bioinformatics)		**Class : I Semester**	**Year : I**	**Session: July 2025- June 2026**
Subject: Chemistry		**Practical**		
1	**Course Code**	BSCBI-102(P)		
2	**Course Title**	Basic Organic Chemistry (Practical)		
3	**Course Type (Core Course/Elective/Generic Elective/Vocational....)**	Minor 1		
4	**Pre-requisite (if any)**	To study this course the students must have the subject Chemistry in 12th Course or equivalent		
5	**Course Outcome**	1. Calibration of Thermometer: Ensure thermometer accuracy. 2. Decolourization and Crystallization of Charcoal: Demonstrate charcoal's decolourizing property and crystallization process. 3. Stereo chemical Study via Models: Understand 3D structure and stereoisomerism. 4. Synthesis of Organic Compounds: Synthesize compounds and apply organic reaction principles.		
6	**Course outcomes (CO's)**	By the end of this course students will be able to the following aspects of Laboratory in chemical analysis: CO1: Calibration of Thermometer CO2: Decolourization and Crystallization of Charcoal CO3: Stereo chemical Study of Organic Compounds via Models. CO4:Synthesis of Different Organic Compounds		
7	**Credit Value**	1 Credit		
	Total Marks	Max. Marks: 30+70		Min. Passing Marks:35

Part B- Content of the Course		
No. of Lectures per week :1		
Total No of Lecture Required: 15		
Unit	**Topics**	**No. of Lectures**
1	**Calibration of Thermometer 03** 1. 80-82° (Naphthalene) 2. 113.5-114° (Acetanilide) 3. 132.5-133° (Urea)	03
2	**Crystallization** Concept of induction of crystallization, Phthalic acid from hot water (using fluted filter paper and steamless funnel), Acetanilide from boiling water.	03
3	**Decolorisation and crystallization using charcoal** Decolorsation of brown sugar (sucrose) with animal charcoal using gravity filtration. Crystallization and decolorisation of impure naphthalene (100g of naphthalene mixes with 0.3 g of Congo Red using 1g decolorizing carbon) from ethanol.	03
4	**Stereochemical Study of Organic Compounds via Models** R and S configuration of optical isomers E, Z configuration of geometrical isomers Conformational analysis of cyclohexanes and substituted cyclohexanes	03
5	**Synthesis of Organic Compounds** a) Acetylation of salicylic acid, aniline, glucose and hydroquinone, Benzoylation of aniline and phenol	03
Note	Students should visit any chemical industry to learn or observe the process and preparations practically and submit the report of that industrial visit also	
Keywords/Tags: Stereochemical Study of Organic Compounds via Models, Calibration of Thermometer, Crystallization, Mixed melting point		

Part – C : Learning Resources
Textbooks, Reference Books, Other Resources
Suggested Readings: **Text Books** 1. Dr. M.M.N. "Tandon unified practical chemistry" Shiva Lal Agarwal & co.

2. Sudha Goyal (Author), R. P. Singh V. K. Singh (Author), Prashant Singh Ashish Dwivedi (Author) B.Sc. Chemistry Practical I , Krishna Prakashan Media
3. Reinhart Keese. Martin P. Brändle. Trevor P. Toube Practical Organic Synthesis: A Student's Guide John Wiley & Sons, Inc..
4. Sudha Goyal B.Sc. Chemistry Practical III Krishna Prakashan Media
5. Furniss, B.S., Hannaford, A.J., Smith, P.W. G., Tatchell, A.R., *Vogel's Text Book of Practical Organic Chemistry", Pearson Education, 2005, 5h Edn.
6. Gurthu, J.N., Kapoor, R., "Advanced Experimental Chemistry", S. Chand and Co., 1987.
7. Sundaram, S., Krishnan, P., Raghavan, P.S., "Practical Chemistry (Part II)", S. Viswanathan Co. Pvt., 1996.
8. Mohd A A, Ramesh K P, Anuradha S, Bassa S, Advanced Laboratory Techniques in Chemistry, Scientific International Publishing house, Tamilnadu, 2024

Reference Books:

1. Furniss, B.S., Hannaford, A.J., Smith, P.W. G., Tatchell, A.R., «Vogel's Text Book of Practical Organic Chemistry", Pearson Education, 2005, 5th Edn.

Suggestive Digital Platform Web Links:

1. https://vlab.amrita.edu/?sub=2&brch=190&sim=338&cnt=1
2. http://www.columbia.edu/itc/barnard/biology/biobc2004/edit/experiments/Experiment1-
3. Spec.pdf
4. http:l/web.pdx.edu/ralfw/uploads/1/0/2/6/10260941/pulse oximetry laboratory guide.pdf
5. https://www.chem.purdue.edu/courses/chm224/Lab-Experiments/expt4 GENESYS V2.pdf
6. http:/lgervind.faculty.mic.edu/biology 101/101 lab/spectrophotometry/4%20 Spectrophotometer%20Fa17.pdf
7. https://www.edag.com/w/images/6/6e/EXPO11 The pH Electrode and Potentiometric Titrations PDF.pdf
8. https://www.philadelphia.edu.jo/academics/ajaber/uploads/CHEM%20540-Chapter%202-Potentiometry-061.pdf
9. https://www.tau.ac.il/~advanal/PotentiometricTitrations.htm
10. https://chem.libretexts.org/Bookshelves/Analytical Chemistry/Book%3A Analytical Chemistry2.1 (Harvey)/11%3A Electrochemical Methods/11,02%3A Potentiometric Methods
11. https://www.chem.purdue.edu/courses/chm224/Lab-Experiments/Exp8. pdf
12. https://www.shcollege.ac.in/wp-content/uploads/NAAC Documents IV Cycle/Criterion-W/2.3.2/ppt/Dr Ignatious ConductometricTitration.pdf
13. https://www.analytik.ethz.ch/praktika/phys anal/POL/Anleitung ENG.pdf

14. https://nph.onlinelibrary.wiley.com/doi/pdf/10.1111/i.1469-8137.1948.tbO5089.x
15. http:l/chemistry.du.ac.in/study material/4103-A/MSC Polarography.pdf
16. https://fac.ksu.edu.sa/sites/default/files/abbe experiment.pdf
17. https://web.mst.edu/~tbone/subjects/tbone/chem224/riproc.pdf
18. http:l/www.fbml.ff.vu.lt/sites/default/files/7 4 en.pdf
19. https://wp.optics.arizona.edu/mnofziger/wp-contentluploads/sites/31/2016/05/OPTI202L-
20. Lab10-0MD2.pdf
21. http://davjalandhar.com/dbt/chemistry/SOP%20LabManuals/B.Sc.%20BT%20SEM620IV.pdf
22. https://vlab.amrita.edu/?sub=1&brch=195&sim=545&cnt=1

Suggested Equivalent Online Courses:

1. https://www.my-mooc.com/en/mooc/basic-analytical-chemistry/
2. https://www.my-mooc.com/en/mooc/principles-electronic-biosensors-purduex-nano535x/

Part D-Assessment and Evaluation			
Suggested Continuous Evaluation Methods:			
Internal Assessment	**Marks**	**External Assessment**	**Marks**
Class Interaction /Quiz	30	Viva Voce on Practical	70
Attendance		Practical Record File	
Assignments (Charts/ Model Seminar / Rural Service/ Technology Dissemination/ Report of Excursion/ Lab Visits/Survey / Industrial visit)		Table work/Experiments	
Total Marks: 100			

PART-A : Introduction				
Programme : B.Sc. (Bioinformatics)		**Class : I Semester**	**Year : I**	**Session : July 2025- June 2026**
Subject : Information Technology			**Theory**	
1.	**Course Code**	BSCBI-103(T)		
2.	**Course Title**	Information Technology		
3.	**Course Type (Core Course/DSE/Minor/MD-ID/SEC/VOC)**	Multidisciplinary		
4.	**Pre-Requisite (if any)**	No Pre-Requisite		
5.	**Course Objectives**	1. To understand and apply IT components and their applications in real-life scenarios. 2. To develop digital literacy, ethical awareness, and cyber hygiene practices among learners. 3. To familiarize learners with IT tools for office work, including the use of Indian languages. 4. To introduce learners to emerging technologies such as Artificial Intelligence (AI) and cloud platforms.		
6.	**Course Outcomes (COs)**	**On completion of this course, learners will be able to:** CO 1. Understand IT components & its applications CO 2. Promote digital literacy, ethical awareness, and cyber hygiene. CO 3. Exposure to IT tools for office work including Indian languages CO 4. Encourage healthy and mindful habits through yoga and Indian values. CO 5. Introduce learners to emerging technologies like AI and cloud platforms.		
7.	**Credit Value**	2 Credits		
8.	**Total Marks**	**Max. Marks: 100**	**Min. Passing Marks: 35**	

PART-B :Content of the Course		
No. of Lectures per week : 02		
Total No. of Lectures required : 30		
Unit	**Topics**	**No. of Lectures required**
I	**Fundamentals of Information Technology & Indian Knowledge Systems** History of Computing: From Ancient Indian contributions (e.g., binary logic in Pingala's Chandaḥśāstra) to modern IT Overview of Computer Systems: Hardware, Software, I/O Devices, Memory Operating Systems (Windows/Linux), File Management Introduction to Number Systems with Indian numeral history Concept of Digital India and e-Governance initiatives **Activity :** 1. Visit to a Digital Seva Kendra (Common Service Center) 2. Create a poster on Indian IT innovations (ISRO, Aadhaar, etc.)	7
II	**Office Tools, Language & Communication in IT** Word Processing, Spreadsheets, and Presentations Use of local languages in IT (Unicode, Google translation tools, Indic typing tools) English for IT: Email Writing, IT vocabulary, presentation skills Language models and voice-to-text (Google Lens, ChatGPT, AI typing tools) UPI and QR Code : Introduction, Functionality, Challenges and Application in Indian context. **Activity :** 1. Prepare a bilingual presentation (English + regional language) 2. Draft an email for a job application and create a digital resume	7
III	**Internet, AI Tools & Cyber security Awareness** Introduction to Internet, Cloud, and Email Cyber security basics: Phishing, Malware, Identity Theft Digital Ethics and Indian perspectives on "Dharma in Technology" Hands-on: Google Workspace, ChatGPT, Canva, Gemini, Indian AI tools Cybercrime awareness: Government portals (CERT-IN, Cyber Crime Reporting Portal). **Activity :** 1. Mock simulation of cybercrime reporting	6

	2. Create a "Stay Safe Online" digital awareness video or poster.	
IV	Text and Image Data: Introduction, Storage Formats for pictures, Image compression fundamentals, Image acquisition with Digital Camera. Audio Data: Introduction, Audio Signals, Acquisition and Storage, Compression Video Data: Introduction, Capturing a moving scene with Video Camera, Compression, MPEG compression standard. **Activity :** 1. Understand how digital images are captured, stored in various formats, and compressed, while analyzing the impact of these factors on quality and size. 2. Understand how audio and video data are captured, stored, and compressed, and how different formats and compression levels affect quality and file size.	5
V	**IT Profession, Indian Values, Yoga & Social Impacts of Technology** Careers in IT: Freelancing, BPO, Data Entry, Web Development, AI Work ethics, time management, and digital wellbeing Indian Values: Satya, Ahimsa, and Seva in Tech Service Yoga for concentration, posture correction, and stress management for IT usersSocial implications: Digital divide, screen addiction, misinformation. **Activity :** 1. Daily 5-minute yoga for eyes and back (Demonstration & practice) 2. Conduct a debate: "Has Technology made us more connected or more isolated?"	5

Part – C : Learning Resources

Textbooks, Reference Books, Other Resources

Suggested Readings:

- Introduction to Information Technology By RAJARAMAN V., PHI Learning Pvt. Ltd. (Fourteenth Printing, Third Edition, January 2018)
- "Fundamentals of Information Technology" – Alexis Leon & Mathews Leon
- Vedic Mathematics 2005, Sterling Publishers Pvt. Ltd. ISBN 978-81-7963-001-3 Reprint 2006, 2009
- "Digital Literacy Curriculum" – MeitY (Govt. of India)

Suggestive Digital Platform Web Links:

- National Digital Library of India (NDLI)

en.wikipedia.orgswayam.gov.in.

- SWAYAM "Fundamentals of Information Technology" (AMU)

swayam.gov.in+11onlinecourses.swayam2.ac.in+11classcentral.com+11.
https://www.nielit.gov.in/content/digital-literacy-courses

Suggested Equivalent Online Courses:

- Diksha Portal, NPTEL, Cyber Surakshit Bharat
- MyGov Cyber Safety Module
- AI Tools Practice : ChatGPT, Bard/Gemini, Canva, Grammarly, Scratch/Python IDEs
- **SWAYAM – Fundamentals of IT (AMU) –**

Comprehensive coverage of Module I, including history, hardware, OS, memory, number systems, and an intro to cybersecurity onlinecourses.swayam2.ac.in+15onlinecourses.swayam2.ac.in+15testbook.com+15.

- **SWAYAM – Course in Information Technology (Savitribai Phule Pune Univ.)**

– A 30-module, 8-week program with cloud introduction, Google Workspace, e-Governance concepts and basic security onlinecourses.swayam2.ac.in+1swayam.gov.in+1.

- **IIT Madras C Programming & Assembly Language (SWAYAM) –**

Ideal for Module IV: hands-on programming, logical thinking, algorithms, flowcharts, and connection to hardware fundamentals

Part D: Assessment and Evaluation		
Internal Assessment Continuous Comprehensive Evaluation (CCE): **30 Marks**		**Total Marks : 100**
External Assessment **Time :**03:00 Hours	**Section (A):** Very Short Questions **Section (B):** Short Questions **Section (C):** Long Questions	**Marks : 70 Marks**
Total Marks	**(Internal Assessment + External Assessment) : 30+70= 100 Marks**	
Credit Value	2 Credits	
Minimum Passing Marks	35 Marks	

SHRI VAISHNAV INSTITUTE OF MANAGEMENT & SCIENCE, INDORE
(Autonomous)

Approved by AICTE, New Delhi and Affiliated to DAVV, Indore & RGPV, Bhopal, Madhya Pradesh, India
UGC-NAAC Accredited 'A' Grade Institute
ISO 9001:2015 Certified

Part A Introduction				
Programme : B.Sc. (Bioinformatics)	**Class : I Semester**	**Year : I**	**Session : July 2025- June 2026**	
Subject: Information Technology				
1.	**Course Code**	BSCBI-103(P)		
2.	**Course Title**	Information Technology (Practical)		
3.	**Course Type (Core Course/ Discipline Specific Elective/ Elective/Generic Elective /Vocational/)**	Multi Disciplinary Course		
4.	**Pre-requisite(if any)**	No Pre-requisite		
5.	**Course Objectives**	1. To familiarize students with basic computer hardware components and their functionality. 2. To develop skills in using office productivity software (word processor, spreadsheet, presentation software). 3. To introduce students to basic networking concepts and internet applications. 4. To develop practical skills in using IT tools for documentation, data analysis, and presentation. 5. To familiarize students with cyber hygiene practices and online safety measures.		
5.	**Course Outcomes (CO's)**	On successful completion of this course, students will be able to- CO1. Assemble, disassemble, and identify computer hardware components. CO2. Proficient in using office software (word processor, spreadsheet, presentation software) to create documents, reports, and presentations. CO3. Understand basic networking concepts and be able to configure and troubleshoot simple networks. CO4. Apply IT tools for data analysis, documentation, and presentation in real-world scenarios. CO5. Demonstrate awareness and practices of cyber hygiene, online safety, and digital citizenship.		
	Credit Value	2 Credit		
7.	**Total Marks**	**Max Marks 30+70**	**Min Passing Marks: 35**	

Part B –Contents of the Course		
No. of Lectures per week: 2		
Total No. of Lectures Required: 30		
S.No.	**Name of the Exercise**	**No. of Lab Hours**
1.	1.Identify and List Computer System Components Open a PC, identify hardware parts (RAM, HDD, motherboard, I/O devices), and create a labelled diagram. 2. Install and Compare OS (Windows vs Linux) Dual-boot or virtual install Linux (Ubuntu), compare file systems, UI, and commands. 3. File Management Operations Create folders, copy/move/delete files, use command-line (Windows CMD or Linux terminal). 4. Number System Converter Using Spreadsheet Convert between Decimal, Binary, Octal, and Hexadecimal. 5. Explore Digital India Portals Navigate portals like UMANG, MyGov, or eDistrict and note their services. 6. Create a Document with Word Processor Prepare a report with headings, bullet points, image insertion, and page formatting. 7. Use Spreadsheets for Budget/Attendance Calculation Formulas, charts, conditional formatting, and data filtering. 8. Prepare a Presentation with Animations Slides with images, transitions, and speaker notes (topic: e-Governance or AI in India). 9. Type a Paragraph in Hindi or Your Local Language Using Google Input Tools or Indic Keyboard with Unicode support. 10. Translate a Passage Using Google Translate Translate English to any Indian language, check accuracy, and voice pronunciation. 11. Practice Email Writing & IT Vocabulary Compose a formal IT-related email; identify 20 IT-specific terms. 12. Test Voice-to-Text Using Google Lens or ChatGPT Speak a paragraph and convert it to digital text. Analyze accuracy and limitations. 13. QR Code Scanner & UPI Demo (Mock Activity) Generate a QR code using a tool, and simulate UPI-based payments (no real transactions). 14. Create and Share a Document Using Google Workspace Collaborate on Google Docs or Sheets with comments and version history. 15. Visit CERT-IN and Cybercrime Portals Explore the Government's cybercrime reporting portal and note key features.	30

Part C- Learning Resources		
Text Books, Reference Books, Other resources		
Suggested Reading:		
Suggested equivalent digital platforms/websites/online courses:		
	16. Hands-on with AI Tools (ChatGPT, Gemini, etc.) Ask an AI to generate a bio, convert text to summary, or translate content. Document outputs. 17. Capture an image, audio, and video using a smartphone or digital camera. Department of Higher Education, Madhya Pradesh Information Technology 6 Save each file in multiple formats (e.g., JPEG, PNG, WAV, MP3, MP4) and record file sizes. Compare quality and size across formats to understand storage and compression. 18. Record audio and video clips and compress them using Audacity and Hand Brake tools. Analyze quality differences and calculate compression ratios. 19. Draw a Flowchart for a Real-Life Task E.g., Making tea, submitting an online form. 20. Daily Yoga Routine for Digital Wellness Follow a 15-min yoga/stretch session for posture & stress relief. Log benefits weekly.	

Part D-Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Internal Assessment	**Marks**	**External Assessment**	Marks
Class Interaction/Quiz	10	Viva Voce Practical	10
Attendance	10	Practical Record File	10
Assessments (Charts/Model/Seminar/Rural Service/ Technology/ Dissemination/Report of Excursion/ Lab Visits/ Survey/ Industrial Visit)	10	Table work/ Experiments	50
	Total Marks : 100		

भाग - अ: परिचय		
कार्यक्रम: बी.सी.ए/बी.एस.सी/बी.बी.ए. / बी.बी.ए. एफ.टी./ बी.बी.ए. एच.ए. **कक्षा:I वर्ष:I सेमेस्टर: I सत्र: July 2025– June 2026**		
विषय: Ability Enhancement Course (AEC) Theory / Practical: Theory		
1.	**Course Code**	**AEC - 101**
2.	**पाठ्यक्रम का शीर्षक**	हिन्दी भाषा और संस्कृति
3.	**पाठ्यक्रम का प्रकार:**	**Ability Enhancement Course (AEC)**
4.	**पूर्वापेक्षा (यदिकोईहो)**	कक्षा 12वीं उत्तीर्ण किसी भी विषय समूह से प्रमाणपत्र किया हो पात्र है
5	**पाठ्यक्रम के उद्देश्य (CO)**	**1:**विद्यार्थियों को भारतीय ज्ञान परंपरा और सांस्कृतिक विरासत से परिचित कराना। **2:**विद्यार्थियों को प्रमुख हिन्दी रचनाकारों और उनकी साहित्यिक कृतियों से अवगत कराना। **3:** भाषा, व्याकरण और शब्दावली की समझ विकसित करना ताकि सांस्कृतिक और साहित्यिक प्रशंसा (appreciation) हो सके। **4:**शास्त्रीय और आधुनिक ग्रंथों के माध्यम से आलोचनात्मक सोच और समझने की क्षमता बढ़ाना। **5:** संरचित भाषा अभ्यास के माध्यम से विद्यार्थियों को प्रतियोगी परीक्षाओं के लिए तैयार करना।

6	**पाठ्यक्रम की उपलब्धि (COs)**	**CO1:**विद्यार्थी भारतीय ज्ञान परम्परा से अवगत होने तथा उससे लाभान्वित होने में सक्षम होंगे। **CO2:**विद्यार्थी हिन्दी के प्रसिद्ध रचनाकारों एवं उनकी साहित्यिक रचनाओं से परिचित होने में सक्षम होंगे। **CO3:**विद्यार्थी भाषा, व्याकरण एवं शब्दावली का ज्ञान अर्जित कर सांस्कृतिक एवं साहित्यिक बोध विकसित करने में सक्षम होंगे। **CO4:**विद्यार्थी शास्त्रीय एवं आधुनिक रचनाओं के माध्यम से आलोचनात्मक सोच और समझ विकसित करने में सक्षम होंगे। **CO5:**विद्यार्थी प्रतियोगी परीक्षाओं हेतु आवश्यक भाषा और साहित्य का अभ्यास करने में सक्षम होंगे।	
7	**क्रेडिट**	**02**	
8	**कुल अंक**	**अधिकतम अंक: 100**	**न्यूनतम उत्तीर्ण अंक: 35**

भाग -ब: पाठ्यक्रम सामग्री		
प्रति सप्ताह कक्षाओं की संख्या :थ्योरी (02 घंटे प्रति सप्ताह)		
आवश्यक व्याख्यानों की कुल संख्या: थ्योरी (T): 30 घंटे		
इकाई	**विषय-सूची**	**व्याख्यानों की संख्या**
I	• भारतीय ज्ञान परम्परा: एक परिचय • भारतीय ज्ञान परम्परा में हिन्दी भाषा • महर्षि पाणिनि – जीवन व दर्शन **गतिविधियाँ:** • भारतीय ज्ञान परम्परा पर आधारित पोस्टर सृजन • भारतीय ज्ञान परम्परा से सम्बंधित ग्रंथों / पुस्तकों का अवलोकन	6
II	• मैथिलीशरण गुप्त: परिचय पाठ – मातृभूमि (कविता) • सूर्यकान्त त्रिपाठी 'निराला: परिचय पाठ – भारत वंदना (कविता) • प्रेमचन्द: परिचय पाठ – शतरंज के खिलाड़ी (कहानी) **गतिविधियाँ:** • कविता का सस्वर वाचन • कहानी वाचन	6
III	• वैचारिक – भारतीय भाषाओं में राम • आचार्य रामचन्द्र शुक्ल: परिचय पाठ: उत्साह (भाव मूलक निबन्ध)	6

	• रामधारी सिंह दिनकर: परिचय पाठ: भारत एक है (संस्कृति) लेख • शरद जोशी: परिचय पाठ: अफसर (व्यंग्य) **गतिविधियाँ:** • निबन्ध लेखन का अभ्यास • भारतीय संस्कृति पर आलेख लेखन	
IV	हिन्दी व्याकरण • शब्द रचना: उपसर्ग एवं प्रत्यय • शब्दप्रकार: तत्सम, तद्भव, देशज, विदेशी, संकर, नवनिर्मितशब्द • पर्यायवाची, विलोमार्थी, अनेक शब्द के लिए एक शब्द **गतिविधियाँ:** • शब्द रचना सम्बन्धी समूह चर्चा • देशज-विदेशी शब्दसूची बनाना	6
V	हिन्दीव्याकरण • हिन्दी के प्रमुख विराम चिह्न • संक्षेपण बीज शब्द – धर्म, अद्वैत, भाषा, अवधारणा **गतिविधियाँ :** • अनुच्छेद/ श्रुतलेख के माध्यम से विराम–चिह्नों का अभ्यास • संक्षेपण का अभ्यास	6

भाग - स: अध्ययन संसाधन
पाठ्य पुस्तकें, संदर्भ पुस्तकें और अन्य संसाधन
अनुशंसित पाठ्य सामग्री: 1. प्रेमचन्द – मानसरोवर खण्ड - 3 2. आचार्य रामचन्द्र शुक्ल – चिन्तामणि, भाग –1 3. शरद जोशी – "कहा जाता है" (व्यंग्य संग्रह) 4. डॉ. वासुदेव नन्दन प्रसाद: आधुनिक हिन्दी व्याकरण और रचना, भारती भवन, ठाकुर बाड़ी रोड, पटना, बिहार
पाठ्य पुस्तकें: 1. भारतीय ज्ञान परम्परा – विविध आयाम (संपादक: प्रो. सरोज शर्मा, शिप्रा प्रकाशन – नई दिल्ली) 2. प्राचीन भारतीय ज्ञान परम्परा (लेखक – डॉ. अच्युत कुमार रायोर, प्रकाशक – श्रीसाईनाथ, प्रकाशन – नागपुर)
संदर्भ पुस्तकें: 1. हिन्दी ज्ञानकोश
अनुशंसित डिजिटल प्लेटफॉर्म वेबलिंक • इंटरनेट सामग्री – टैग में उल्लिखित

भाग - द: अनुशंसित मूल्यांकन विधि		
केवल बाह्य मूल्यांकन		**Total Marks: 100**
बाह्य मूल्यांकन: अंत- सेमेस्टर परीक्षा **समय:** 02 घंटे	(अ) तीन अति लघु प्रश्न (प्रत्येक 50 शब्द) (ब) चार लघु प्रश्न (प्रत्येक 200 शब्द) (स) दो दीर्घ प्रश्न (प्रत्येक 500 शब्द)	**Marks:** 03×04 = 12 04×13 = 52 02×18 = 36 **कुल अंक: 100**
अधिकतम अंक:	**बाह्य मूल्यांकन:**100	
क्रेडिट मूल्य	02	
न्यूनतम उत्तीर्ण अंक	35	

PART-A : Introduction			
Programme : B.Sc.(Bioinformatics)	**Class : I Semester**	**Year : I**	**Session : July 2025- June 2026**

Subject :	Digital Marketing	**Theory**	
1.	Course Code	SEC-101	
2.	Course Title	Digital Marketing	
3.	Course Type	SEC	
4.	Pre-Requisite	NIL	
5.	Course Objectives	1. To develop a comprehensive understanding of digital marketing concepts and tools. 2. To Integrate Indian cultural and traditional insights into digital marketing strategies. 3. To design and execute a real digital marketing campaign.	
6.	Course Outcomes (CO's)	On successful completion of this course, the students will be able to: CO1: Explain the concepts and tools of digital marketing. CO2: Apply digital marketing strategies using Indian cultural and traditional insights. CO3: Design and execute a digital marketing campaign. CO4: Analyze the legal frame work and ethical responsibilities involved in digital marketing.	
7.	Credit Value	3 Credits	
8.	Total Marks	Max.Marks:100	Min. Passing Marks:35

PART B: Content of the Course (Theory)		
No. of Lectures per week : 03		
Total No. of Lectures required :45		
Unit	**Topics**	**No. of Lectures**
I	**Introduction to Digital Marketing:** Meaning, scope, and significance of digital marketing**;** Difference between digital and traditional marketing**;** Overview of digital marketing channels: SEO, SEM, Social Media, Email; Career opportunities in digital marketing**.** **Practical Activities-** • Students analyze different digital marketing channels(e.g., social media, search engines, email, display ads) and identify their advantages and disadvantages. • Students debate ethical issues indigital marketing, • Students will analyze Indian brands (e.g., Amul, Tanishq, Paper Boat, Fab India) that integrate traditional values with modern marketing approaches. • Group presentation or written report based on selected case.	18
II	**Customer Research: Digital Consumer Behavior:** Characteristics and factors affecting; Digital Marketing Strategy and Campaign Planning: Segmentation and targeting in the digital environment; **Practical Activity-** • List out various e-commerce apps/platforms. • Students will explore campaigns (e.g., Surf Excel's "Daag Acche Hain–Holi", Cadbury's Diwali campaigns) to study targeting, emotions, platform use, and outcomes. Comparative analysis and class discussion to be encouraged. • Choose a marketing-related topic (e.g., influencer marketing, consumer behaviour trends, and sustainability in branding). • Create engaging and informative content using simple tools like Canva or Google Docs.	15

III	**Legal & Ethical Issues in Digital Marketing:** Meaning of ethics in digital marketing, Importance of ethical behavior for brand image and customer trust; Data Protection Laws in India **Practical Activity-** • Students examine real or hypothetical digital ads and identify potential legal or ethical violations. • Role-play a scenario where a marketing team debates whether to use consumer data without consent.	12
Keywords/Tags: Digital Marketing, Content Marketing, Legal & Ethical Issues, Customer Research, Strategy, Technology		

Part C-Learning Resources
Text Books, Reference Books, Other resources
• Mathur, Vibha & Arora, Saloni. (2020). Digital Marketing. PHI Learning. • Babu KG Raja Sabarish, Anbazhagan B, Meenakumari S. (2023). Digital Marketing. Sultan Chand & Sons. • Swaminathan T. N. & Karthik Kumar. (2019). Digital Marketing: From Fundamentals to Future. Cengage India. • Chaffey, D. (2022). Digital marketing: Strategy, implementation and practice (8th ed.). Pearson. • Deiss, R., & Henneberry, R. (2020). Digital marketing for dummies (2nd ed.). Wiley. • Mahadevan, B. (2022). Textbook on Indian knowledge systems. Indian Institute of Management Bangalore. • The Readers Paradise. (2025). Indian knowledge system: Principles and practices.
Suggestive digital platforms weblinks: SWAYAM Course: Digital Marketing https://onlinecourses.swayam2.ac.in/ugc19_hs26/preview

Part D- Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Internal Assessment: No Internal Assessment	Class Test Assignment/Presentation	Nil
External Assessment: Time : 03.00 Hours	**Section (A):** Objective Type Questions	10 Marks
	Section (B): Short Questions (200 Words Each)	40 Marks
	Section (C): Long Questions (500 Words Each)	50 Marks
Total Marks	**(Internal Assessment + External Assessment) :** 30+70=100	
Credit Value	3	
Minimum Passing Marks	35	

PART – A: Introduction			
Program: BBA/ BCA/ B. Sc.	**Class: I Year**	**Semester: I**	**Session : July 2025- June 2026**
Subject: Project Work		**Theory / Practical: Practical**	

1	**Course Code**	PW/ Ap/ CE - 101	
2	**Course Title**	Project Work	
3	**Course Type (Core Course/DSE/Minor/MD-ID/SEC/VOC)**	Project Work (PW) PW/Ap/ CE	
4	**Pre-Requisite (if any)**	Open for all	
5	**Course Objectives (CO)**	**1:** To develop practical understanding of basic management and business concepts. **2:** To enhance analytical and problem-solving skills through field or desk research. **3:** To improve teamwork, communication, and presentation skills. **4:** To familiarize students with local business practices and entrepreneurship. **5:** To cultivate data collection, interpretation, and reporting skills.	
6	**Course Outcomes (COs)**	**CO1:** Students will be able to apply theoretical concepts to real-world business scenarios. **CO2:** Students will be able to demonstrate improved research and analytical skills using surveys, interviews, or observation. **CO3:** Students will be able to enhance team coordination and professional communication. **CO4:** Students will be able to gain exposure to local industries, markets, and entrepreneurial challenges. **CO5:** Students will be able to prepare structured reports and presentations effectively.	
7	**Credit Value**	**02**	
8	**Total Marks**	**Max. Marks: 100**	**Min. Passing Marks: 35**

PART – B: Content of the Course	
No. of Lectures per week: Theory (02 Hours per week)	
Total No. of Lectures required: P: 60 Hours	
Topics	**No. of Lectures**
As part of the Skill Based Activity students are required to undertake Project Work. It is designed to provide practical exposure, industry orientation and application of classroom learning in real business scenarios. For this, students are required to: 1. Select an Industry/Organization - Identify a suitable industry or organization for undertaking the project work. 2. Observe Operations - Visit the organization to observe its operations, processes, and overall working environment. 3. Understand Organizational Structure - Interact with employees at various levels to comprehend the hierarchy and organizational structure. 4. Choose a Functional Area - Select a specific functional area (e.g. Marketing or Human Resources or Operations or Finance) for detailed study. 5. Collect and Analyze Data - Gather and analyze data related to the chosen area using both primary sources (interviews, discussions, surveys) and secondary sources (reports, websites, manuals). 6. Prepare and Present Report - Compile a comprehensive project report that includes the company profile, observations, data analysis, key learnings, and actionable recommendations.	**60**

Part C: Assessment and Evaluation	
Suggested Continuous Evaluation Method:	
External Assessment	**Marks**
Viva Voce on Practical (20 Marks)	100
Practical Record File (20 Marks)	
Table Work/Exercise Assigned (60 Marks)	
Total Marks: 100	

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Syllabus

Bachelor of Science (Bioinformatics)

[B. Sc. (BI)]

Year I / Semester II

w.e.f. Session 2025 -2026

Scheme No. 71, Gumasta Nagar, Indore-452009 Madhya Pradesh, Ph. : 0731-2780011, 2789925
Toll Free No. : 1800 233 2601 Website : www.svimi.org E-mail address : svimi@svimi.org

B.Sc. (Bioinformatics) II Semester				
Session: January - June 2026				
S. No.	**Course Type**	**Course Code**	**Subject**	**Total Credit**
1.	Major II (Core Course)	BSCBI - 201 (T)	Fundamentals of Cell Biology (Theory)	4
		BSCBI - 201 (P)	Fundamentals of Cell Biology (Practical)	2
2.	Major III (Core Course)	BSCBI - 202 (T)	Fundamentals of Molecular Biology (Theory)	4
		BSCBI - 202 (P)	Fundamentals of Molecular Biology (Practical)	2
3.	Minor II	BSCBI - 203 (T)	Applied Chemistry (Theory)	3
		BSCBI - 203 (P)	Applied Chemistry (Practical)	1
4.	Ability Enhancement Course	AEC-201	English Language & Indian Culture	2
5.	Value Added Course	VAC-201	भारत बोध (Understanding India)	2
			Total Credits	20

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PART-A:Introduction			
Programme: B.Sc.(Bioinformatics)		**Class : I Year** **Semester : II** **Session: January - June 2026**	
Subject: Bioinformatics		**Theory/Practical: Theory**	
1.	**Course Code**	BSCBI - 201 (T)	
2.	**Course Title**	Fundamentals of Cell Biology (Theory)	
3.	**Course Type (Core Course/DSE/Minor/MD-ID/SEC/VOC)**	Major II (Core Course)	
4.	**Pre-Requisite(if any)**	To study this course ,a student must have Biology and/or Mathematics as one of the subjects in class XII	
5.	**Course Objectives**	1. To understand the structural and functional organization of prokaryotic and eukaryotic cells. 2. To study the composition, structure, and roles of cellular organelles. 3. To explain the molecular basis of cell membrane structure and transport mechanisms. 4. To analyze the processes of cell division (mitosis and meiosis) and their control.	
6.	**Course Outcomes (COs)**	On successful completion of this course, learners will be able to: COl. Describe the fundamental structural and functional organization of prokaryotic and eukaryotic cells. CO2. Explain the principles and applications of various microscopy techniques and cell fractionation methods. CO3. Detail the structure and functions of major cell organelles and their interactions. CO4. Outline the mechanisms of protein trafficking and sorting within the cell. CO5. Describe the structure and function of the cytoskeleton and its role in cellular processes. CO6. Explain the stages of the cell cycle, cell division, and the processes of cell death and renewal.	
7.	**Expected Job Role / Career Opportunities:**	• Laboratory Technician in research or diagnostic laboratories • Research Assistant in universities or research institutes • Cell Culture Technician handling cell lines and tissue culture • Quality Control / Production roles in biotech and pharmaceutical companies • Clinical Research Coordinator / Assistant	
8.	**Credit Value**	**Theory** - 4 Credits	
9.	**Total Marks**	**Max. Marks: 30+70**	**Min. Passing Marks: 35**

PART-B:Content of the Course		
Total No. of Lectures required: 60 hrs		
I	**Introduction to Cell Biology and Microscopy** Prokaryotic (Archaea and Eubacteria) and Eukaryotic Cell (Animal and Plant Cells): Comparative study, cells as experimental models. Early concept of fundamental unit of life in ancient India. Tools of Cell Biology: Light microscopy, Phase contrast microscopy, Fluorescence microscopy, Confocal microscopy, Electron microscopy (TEM and SE FACS fluorescence-activated cell sorting). Cell Fractionation: Centrifugation techniques for subcellular fractionation. **Activity:** Present comparative analysis of microscopic techniques. **Keywords:** Prokaryotic cell, Eukaryotic cell, Cell structure, Light microscopy, Phase contrast microscopy, Fluorescence microscopy, Confocal microscopy, Electron microscopy, FACS, Cell fractionation, Centrifugation, Ultracentrifugation.	12
II	**Cell Membranes and Extracellular Matrix** Cell Membrane: Physicochemical Properties; Molecular Organization - asymmetrical organization of lipids, proteins and carbohydrates; and Functions, Molecular Models and Biogenesis of Cell Membrane Extracellular Matrix and Cell Wall: Prokaryotic and eukaryotic cell walls, composition and functions. Extracellular matrix (ECM) components in animals and functions Cell-Matrix and Cell-Cell Interactions: Adherence junctions, Tight junctions, Gap junctions, Desmosomes, Hemidesmosomes, Focal adhesions, Plasmodesmata. **Activity:** Design and explain a model of membrane or ECM. **Keywords:** Cell wall, Extracellular matrix, ECM, Cell junctions, Adherence junctions, Tight junctions, Gap junctions, Desmosomes, Hemidesmosomes, Focal adhesions, Plasmodesmata, Cell adhesion.	12
III	**Structure and Function of Cell Organelles** Nucleus: Structure of the nuclear envelope, nuclear pore complex, nucleolus, and chromatin. Endoplasmic Reticulum (ER) and Golgi Apparatus: Structure and functions of rough ER, smooth ER, and Golgi apparatus. Lysosomes, Peroxisomes, and Vacuoles: Structure and functions of lysosomes, peroxisomes, and vacuoles. Mitochondria and Chloroplasts: Structure and functions of mitochondria and chloroplasts, including their role in energy production.	12

	Activity: Briefly describe organelle roles through interactive exchange. **Keywords**: Nucleus, Nuclear envelope, nuclear pore complex, Nucleolus, Chromatin, Endoplasmic reticulum, ER, Golgi apparatus, Lysosomes, Peroxisomes, Vacuoles, Mitochondria, Chloroplasts, Organelles.	
IV	**Protein Trafficking and Cytoskeleton** Protein Trafficking: Selective transport of proteins to and from the nucleus, ER, Golgi, mitochondria, and chloroplasts. Mechanisms of protein import and export, signal sequences, and targeting pathways. Vesicular transport, cargo selection, coat proteins, vesicle budding, and vesicle fusion. Cytoskeleton: Structure and organization of act in filaments, microtubules, and intermediate filaments. Microfilament polymerization, organization of act in filaments, non-muscle myosin. Intermediate filament proteins, assembly and intracellular organization. Assembly, organization, and movement of cilia and flagella. **Activity**: Visually represent protein movement within the cell. **Keywords**: Protein trafficking, Signal sequences, Vesicular transport, Coat proteins, Vesicle budding, Vesicle fusion, Cytoskeleton, Act in filaments, Microtubules, Intermediate filaments, Myosin, Cilia	12
V	**Cell Cycle, Cell Death, and Cell Renewal** Cell Cycle: Eukaryotic cell cycle phases (Gl, S, G2, M), regulation of the cell cycle, restriction point, and checkpoints. Cell Division: Mitosis and meiosis: detailed stages and significance. Cell Death: Apoptosis and necrosis: mechanisms and roles in development and disease. Cell Renewal: Stem cells and their role in tissue maintenance and repair. **Activity:** Illustrate or debate cell cycle regulation and its consequences. **Keywords:** Cell cycle, Mitosis, Meiosis, Apoptosis, Necrosis, Cell death, Cell renewal, Stem cells, Check points Cell division.	12

Part C-Learning Resources
Text Books, Reference Books, Other resources
Suggested Readings: 1. Molecular Cell Biology, Lodish, H., Berk, A. et, al, WH Freeman & Co Ltd., 2016 2. Molecular Biology of the Cell, Alberts, B., W.W. Norton, United States, 2017. 3. The Cell: A Molecular Approach 5th ed., Cooper, G.M. and Hausman, R.E., ASM Press & Sunderland (Washington DC), Sinauer Associates,2009. 4. Karp's Cell Biology Global Edition, Karp, G., Iwasa, J., Marshall, W., Wiley,United States,2018. 5. Cell biology, Reproductive biology and developmental biology, Mishra, K.K., MP Hindi Granth Academy. 6. Microbiology, Shrivastava, B., MP Hindi Granth Academy.
Suggested equivalent online courses: 1. https://nptel.ac.in/courses/102108086 2. https://nptel.ac.in/courses/102103012 3. https://nptel.ac.in/courses/102106025

Part D:Assessment and Evaluation		
Suggested Continuous Evaluation Methods: Maximum Marks: Continuous Comprehensive Evaluation (CCE) : University Exam (UE) : Time : 03:00 hours		100 30 70
Internal Assessment Continuous Comprehensive Evaluation(CCE)	Class Test	15
	Assignment/Presentation	15
	Total	30
External Assessment University Exam Section	**Section(A)**:Very Short Questions **Section(B)**:Short Questions **Section(C)**:Long Questions	70

Part A Introduction		
Programme: B.Sc.(Bioinformatics)	**Class : I Year**	**Semester : II** **Session: January- June 2026**
Subject: Bioinformatics	**Theory/Practical: Practical**	
1.	**Course Code**	BSCBI - 201 (P)
2.	**Course Title**	Fundamentals of Cell Biology (Practical)
3.	**Course Type**	Major II (Core Course)
4.	**Pre-requisite(if any)**	To study this course, a student must have Biology and/or Mathematics as one of the subjects in class XII.
5.	**Course Objectives**	1. To learn basic microscopy techniques for observing cell structures. 2. To acquire skills in preparing and staining plant and animal cells for visualization. 3. To identify and study cell organelles using histological and cytological methods. 4. To observe and analyze stages of mitosis and meiosis in suitable specimens.
6.	**Course Outcomes (COs)**	On successful completion of this course, the learners will be able to: CO1. Use a light microscope effectively and prepare various types of biological specimens for observation. CO2. Identify and differentiate various cell types and organelles. CO3. Perform basic cell biology techniques, such as cell staining and fractionation
7..	**Expected Job Role / Career Opportunities:**	• Laboratory Technician in research or diagnostic laboratories • Research Assistant in universities or research institutes • Cell Culture Technician handling cell lines and tissue culture • Quality Control / Production roles in biotech and pharmaceutical companies • Clinical Research Coordinator / Assistant
8.	**Credit Value**	**Practical** -2 Credits
9.	**Total Marks**	**Max. Marks:100** **Min. Passing Marks:35**

	Part B-Content of the Course **Total No. of Lectures-30 hrs.**	
Practical	**Topics**	**No. of Lectures)**
	1. Visualization of animal and plant cell by methylene blue. 2. Identification of different stages of mitosis in onion root tip. 3. Identification of different stages of meiosis in grasshopper testis. 4. Micrographs of different cell components (dry lab). 5. Sub-cellular fractionation. 6. Visualization of nuclear fraction by acetocarmine stain. **7**. Staining and visualization of mitochondria by Janus green stain.	**30**

Part C-Learning Resources

Text Books ,Reference Books, Other Resources

Suggested Readings:

1. Molecular Cell Biology, Lodish, H., Berk, A. et, al, WH Freeman & Co Ltd., 2016
2. Molecular Biology of the Cell, Alberts, B., W.W. Norton, United States, 2017.
3. The Cell: A Molecular Approach 5th ed., Cooper, G.M. and Hausman, R.E., ASM Press & Sunderland (Washington DC), Sinauer Associates,2009.
4. Karp's Cell Biology Global Edition, Karp, G., Iwasa, J., Marshall, W., Wiley, United States, 2018.
5. Cell biology, Reproductive biology and developmental biology, Mishra, K.K., MP Hindi Granth Academy Microbiology, Shrivastava, B., MP Hindi Granth Academy.

Suggested equivalent online courses:

1. https://nptel.ac.in/courses/102108086
2. https://nptel.ac.in/courses/102103012
3. https://nptel.ac.in/courses/102106025

Part D-Assessment and Evaluation			
Suggested Continuous Evaluation Methods:			
Internal Assessment	**Marks**	**External Assessment**	**Marks**
Class Interaction/Quiz	30	Viva Voce on Practical	70
Attendance		Practical Record File	
Assignments (Charts/Model Seminar/Rural Service/Technology/Dissemination/Report of Exclusion /Lab Visits/Survey/Industrial visit)		Table work/Experiments	
Total Marks:100			

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PART-A:Introduction		
Programme: B.Sc.(Bioinformatics)	**Class : I Year Semester: II Session: January – June 2026**	
Subject: Bioinformatics	**Theory/Practical: Theory**	
1.	**Course Code**	BSCBI – 202 (T)
2.	**Course Title**	Fundamentals of Molecular Biology (Theory)
3.	**Course Type (Core Course/DSE/Minor/MD-ID/SEC/VOC)**	Major III (Core Course)
4.	**Pre-Requisite (if any)**	To study this course, a student must have Biology and/or Mathematics as one of the subjects in class XII
5.	**Course Objectives**	1. Understanding of Basic Molecular Biology Concepts. 2. Understanding of Basic Molecular Genetics and Genomics. 3. Understanding of Basic Techniques in Molecular Biology. 4. To observe and analyze Cellular Mechanisms and Regulation.
6.	**Course Outcomes (COs)**	On successful completion of this course, the learners will be able to: CO1. Describe the basic structure and function of DNA and RNA. CO2. Explain the mechanisms of DNA replication, transcription, and translation. CO3. Outline the processes of gene regulation and expression. CO4. Discuss the principles of genetic mutations and DNA repair. CO5. Apply basic molecular biology techniques and interpret experimental data.
7.	**Expected Job Role / Career Opportunities**	• Laboratory Technician / Lab Analyst • Research Assistant • Clinical Research Coordinator • Quality Control (QC) Analyst • Molecular Diagnostics Technician
8.	**Credit Value**	**Theory**- 4 Credits
9.	**Total Marks**	**Max. Marks: 30+70** **Min. Passing Marks: 35**

PART-B: Content of the Course		
Total No. of Lectures required: 60 hrs		
I	**Structure and Properties of Nucleic Acids** Nucleic Acid Chemistry: Phosphodiester bonds, nucleotide structure, chemical modifications of bases. DNA Structure: Double helix, base pairing, major and minor grooves, different forms of DNA (A, B, Z), supercoiling. RNA Structure: Types of RNA (mRNA, RNA, rRNA), secondary and tertiary structure, RNA folding. Biophysical Properties of Nucleic Acids: Denaturation and renaturation, hyperchromic effect, Tm, viscosity. **Activity:** Construction of physical or digital models of DNA and RNA structures to visualize their properties. **Keywords:** Nucleotides, Phosphodiester bonds, DNA, RNA, Double helix, Base pairing, Supercoiling, mRNA, tRNA, rRNA, Denaturation, Renaturation, Hyperchromic effect, Tm. DNA Replication and Repair	12
II	**Central Dogma of Molecular Biology** DNA Replication: Semi-conservative replication, origin of replication, replication fork, DNA polymerases, topoisomerases, helicases, primase, ligase, and other replication enzymes. Mechanism of DNA replication in prokaryotes and eukaryotes. Replication Fidelity: Proofreading mechanisms, importance of accurate replication. DNA Repair: Types of DNA damage (e.g., UV damage, chemical damage), mechanisms of DNA repair (e.g., base excision repair, nucleotide excision repair, mismatch repair, double-strand break repair). **Activity:** A visual simulation or diagram illustrating the process of DNA replication at the replication fork. **Keywords:** DNA replication, Semi-conservative replication, Replication fork, DNA polymerase, Topoisomerase, Helicase, Primase, Ligase, Proofreading, DNA repair, Base excision repair, Nucleotide excision repair, Mismatch repair, Double-strand break repair.	12
III	Transcription and RNA Modification and Processing in Prokaryotes and Eukaryotes. Transcription in Prokaryotes: RNA polymerases, promoters, transcription initiation, elongation, termination and anti-termination, sigma and anti-sigma factors.	12

	Transcription in Eukaryotes: RNA polymerases, promoters, enhancers and other cis acting DNA elements, transcription factors, mechanism of transcription initiation, elongation, termination. RNA Modification and Processing: Capping and polyadenylation, Splicing of pre tRNA, mRNA and rRNA, RNA editing. Ribozymes and RNAi: Catalytic RNAs, small interfering RNAS (siRNAs), microRNAs (miRNAs), roles in gene regulation. **Activity:** Preparation of a detailed outline explaining the steps and key components involved in the transcription process. **Keywords:** Transcription, RNA polymerase, Promoter, Splicing, Capping, Polyadenylation, RNA editing, Ribozymes, RNAi, siRNA, miRNA.	
IV	Translation and Post-translational Modifications Translation: Genetic code, codons, anticodons, tRNA charging, ribosomes, translation initiation, elongation, and termination. Post-translational Modifications: Covalent modifications of proteins (eg., glycosylation, phosphorylation, ubiquitination, and other modifications), Protein folding, Biological significance of post-translational modifications Regulation of Protein Synthesis: Translational control, factors affecting protein synthesis. **Activity:** Exercises translating mRNA sequences into polypeptide chains using the genetic code. **Keywords:** Translation, Genetic code, Codon, Anticodon, tRNA, Ribosome, Post-translational modification, Protein folding, Phosphorylation, Ubiquitination. Glycosylation.	12
V	**Gene, Regulation of Gene Expression, Mutation and Transposons** Gene: Chemical nature of gene, split gene, crypto-genes and overlapping genes. Regulation of gene expression in Prokaryotes: Operons (lac, trp, ara operons), positive and negative control. Regulation of gene expression in Eukaryotes: Families of Transcription factors, cis acting DNA elements (eg., promoters, enhancers, silencers etc) chromatin remodeling, epigenetic regulation. Mutations: Types of mutations (point mutations, insertions, deletions, chromosomal rearrangements), mutagens, mechanisms of mutagenesis. Mobile Genetic Elements: Transposons, insertion sequences. **Activity:** Analysis of case studies or scenarios involving operon regulation in prokaryotes. **Keywords:** Gene, Gene regulation, Operon, Transcription factor, Enhancer, Silencer, Chromatin remodeling. Epigenetic regulation, Mutation, Mutagen, Transposon**.**	12

Part C-Learning Resources
Text Books, Reference Books, Other resources
Suggested Readings: 1. Molecular Biology: Genes to Proteins, Tropp, Burton E., N.p., Jones & Bartlett Learning, LLC, 2020. 2. Molecular Biology of the Gene, Watson James D., et al. Pearson Education, 2017. 3. Lewin's Genes XII (2017) 12th Edition, Krebs, J.E., Goldstein, E.S. & Kilpatrick, S.T., Jones and Bartlett Publishers, Inc. USA, ISBN-10: 1284104494 4. Lehninger: Principles of Biochemistry 6th ed., Nelson, D.L. and Cox, M.M., W. H., Freeman & Company (New York), ISBN:13: 978-1-4292-3414-6/ISBN:10-14641-0962-1, 2013. 5. Principles of Genetics 5th ed., Snustad, D.P. and Simmons, M.J., John Wiley & Sons Asia, ISBN:978-0-470-39842-5,2010. 6. Biomolecules and Structural Biology, Pathak, J.P.N., MP Hindi Granth Academy. 7. Molecular biology and genetics, J.P.N., MP Hindi Granth Academy. 8. Genetics, Sharma, A.and Sharma V., MP Hindi Granth Academy.
Suggested equivalent online courses: 1. https://nptel.ac.in/courses/102103341 2. https://ugcmoocs.inflibnet.ac.in/index.php/courses/view ug/75

Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods: Maximum Marks: Continuous Comprehensive Evaluation (CCE) : University Exam (UE) : Time : 03:00 hours		100 30 70
Internal Assessment Continuous Comprehensive Evaluation(CCE)	Class Test	15
	Assignment/Presentation	15
	Total	30
External Assessment University Exam Section	**Section(A)**:Very Short Questions **Section(B)**:Short Questions **Section(C)**:Long Questions	70

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Part A Introduction		
Programme: B.Sc.(Bioinformatics)	**Class : I Year**	**Semester: II** **Session:January-June2026**
Subject: Bioinformatics		**Theory/Practical : Practical**
1.	**Course Code**	BSCBI – 202 (P)
2.	**Course Title**	Fundamentals of Molecular Biology (Practical)
3.	**Course Type**	Major III (Core Course)
4.	**Pre-requisite (if any)**	To study this course, a student must have Biology and/or Mathematics as one of the subjects in class XII
5.	**Course Objectives**	1. To understand and mastering in molecular biology laboratory Techniques. 2. Design and plan molecular biology experiments 3. Collect and analyze experimental data, such as PCR results or DNA fragment sizes, using relevant software (e.g., gel analysis software).
6.	**Course Outcomes (COs)**	On successful completion of this course, the learners will be able to: CO1. Measure the amount of DNA and RNA in a sample. CO2. Describe key properties of DNA, such as melting temperature. CO3. Use lab equipment to analyze DNA and RNA. CO4. Explain the relationship between DNA structure and its properties. CO5. Perform basic lab techniques for working with DNA and RNA.
7.	**Expected Job Role / Career Opportunities**	• Laboratory Technician / Lab Analyst • Research Assistant • Clinical Research Coordinator • Quality Control (QC) Analyst • Molecular Diagnostics Technician
8.	**Credit Value**	**Practical** - 2 Credits
9.	**Total Marks**	**Max Marks:100** **Min. Passing Marks : 35**

PART-B: Content of the Course		
Total No. of Lectures required: 30 hrs		
Practical	**Topics**	**No. of Lectures**
	1. Determination of DNA by diphenylamine reaction 2. Determination of RNA by means of orcinol reaction 3. Measurement of the Absorption spectrum of DNA 4. Determination of DNA and RNA concentration by measuring A260. 5. Determination of the melting temperature and GC content of DNA. 6. To study the viscosity of DNA solutions. Keywords/Tags: DNA, RNA, DPA, Orcinol, Amax, Tm, Viscosity	30

Part C-Learning Resources
Text Books ,Reference Books, Other Resources
Suggested Readings: 1. Molecular Biology: Genes to Proteins, Tropp, Burton E., N.p., Jones & Bartlett Learning, LLC, 2020. 2. Molecular Biology of the Gene, Watson James D., et al. Pearson Education, 2017. 3. Lewin's Genes XII (2017) 12th Edition, Krebs, J.E., Goldstein, E.S. & Kilpatrick, S.T., Jones and Bartlett Publishers, Inc. USA, ISBN-10: 1284104494 4. Lehninger: Principles of Biochemistry 6th ed., Nelson, D.L. and Cox, M.M., W. H., Freeman & Company (New York), ISBN:13: 978-1-4292-3414-6/ISBN: 10-14641-0962-1,2013. 5. Principles of Genetics 5th ed., Snustad, D.P. and Simmons, M.J., John Wiley & Sons Asia, ISBN:978-0-470-39842-5,2010. 6. Biomolecules and Structural Biology, Pathak, J.P.N., MP Hindi Granth Academy. 7. Molecular Biology and Genetics, J.P.N., MP Hindi Granth Academy. 8. Genetics, Sharma, A. and Sharma V., MP Hindi Granth Academy.
Suggested equivalent online courses: 1. https://nptel.ac.in/courses/102103341 2. https://ugcmoocs.inflibnet.ac.in/index.php/courses/view_ug/75

Part D-Assessment and Evaluation			
Suggested Continuous Evaluation Methods:			
Internal Assessment	**Marks**	**External Assessment**	**Marks**
Class Interaction/Quiz	30	Viva Voce on Practical	70
Attendance		Practical Record File	
Assignments(Charts/Model Seminar/Rural Service/Technology/Dissemination/Report of Exclusion /Lab Visits/Survey/Industrial visit)		Table work/Experiments	
Total Marks:100			

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Part A : Introduction			
Programme: B.Sc. (Bioinformatics)		**Class : I Year Semester: II Session: January - June 2026**	
Subject: Chemistry		**Theory/ Practical: Theory**	
1.	**Course Code**	BSCBI – 203 (T)	
2.	**Course Title**	Applied Chemistry (Theory)	
3.	**Course Type (Core Course/Elective/Generic Elective/Vocational)**	Minor II	
4.	**Pre-requisite (if any)**	To study this course the students must have the subject Chemistry in XII Course or equivalent	
5.	**Course Objectives**	1.To analyze ancient engineering in urban drainage, metallurgy, and brick-making. 2. To classify drugs by their therapeutic action and identify chemical causes of diseases. 3.To identify chemical pollutants and evaluate scientific methods for their prevention and control. 4.To explain the biochemical functions of food components (nutrients) in body metabolism. 5.To understand the chemical processes behind paper pulping and the structure of textile fibers.	
6.	**Course Outcomes (COs)**	On completing this course, the learners will be able to : CO1.Understand Indigenous Technology in Harappan Period. CO2.Understand Chemistry of medicines, common diseases and their causes. CO3. Understand Pollution, its causes, prevention and control CO4. Acquire knowledge of various components of food and their role in the body CO5. Understand chemistry of paper and textiles	
7.	**Expected Job role/ Career Opportunity**	• Pharmacologist, Drug Inspector • Pollution Control Officer • Nutritionist, Quality Safety Office • Textile Chemist, Lab Analyst	
8.	**Credit Value**	**Theory** –3 credit	
9.	**Total Marks**	Max. Marks: 30+70	Min. Passing Marks: 35

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Part B Content of the Course		
Total No. of lectures: 45		
Unit	**Topic**	**No. of Lectures**
1	**Indigenous Technology in Harappan Period** Introduction, Indus or Harappan Civilization, Later Pottery, Knowledge of metallurgy after & during the Harappans, weight measurement, medical science, Jewell making, Dyeing, Pigments, Philosophers Stone, Wootz Steel, Gold, Silver, Mercury, Tin, Lead, Gun Powder, Glass making, Paints, Perfumes. **Keywords/Tags:** Indus and Harappan Civilization, Later Pottery, Wootz Steel, Glass making, Paints, Perfumes **Activities:** 1. Gather data on the processes used to purify zinc both historically and currently. 2. Gather images and records pertaining to the history of two rust-resistant monuments built in India. 3. Prepare the Project and Modals related to Ancient Indian Chemistry 4. Educational Tour of Industries and Research Institutes	9
2	**Chemistry of medicine** Common diseases and their causes, concept of analgesic, antibiotics, anti depressant, antihypertensive, antipyretics and anticoagulants. Concept of bronchodilators, vaccines, anta acids and diuretics, drug metabolism-absorption, distribution, metabolism and excretion (ADME) **Keywords/Tags:** analgesic, antibiotics, anti depressant, antihypertensive, antipyretics, anticoagulants	9
3	**Pollution and its causes** **Air pollution**- causes, effect and prevention **Water pollution**- sources and effect of water pollution **Soil pollution**- sources and effect of soil pollution **Noise pollution**- causes and effect of noise pollution, prevention **e-waste pollution**- causes and effect of e-waste pollution, prevention. Radioactive pollution- causes and effects of radioactive pollution, prevention, nuclear weapons, nuclear power plants, Chernobyl disaster **Keywords/Tags:** Air pollution, Water pollution, Soil pollution, Noise pollution, e-waste pollution	9
4	**Components of food and their role in the body** **Carbohydrates**- simple sugar- glucose, fructose and their chemical properties. Complex carbohydrates- starch, cellulose and their digestion. **Proteins**- amino acids as building blocks of proteins, protein structure-primary, secondary, tertiary and quarternary, denaturation of protein and	9

	its application in cooking. **Lipids/ fats-** triglyceride, phospholipids, cholesterol, mono saturated and poly saturated fatty acids, role of fats in cell membrane and hormone production **Vitamins-** classification of vitamins, water soluble and fat soluble, chemical structure and function of key vitamins- vitamin C, vitamin A, vitamin D, vitamin B complex. **Minerals-** essential minerals- calcium, iron, sodium, potassium etc. mineral bioavailability and factors affecting absorption **Keywords/Tags:** Carbohydrates, Proteins, Lipids/ fats, Vitamins, Minerals	
5	**Chemistry of paper and textile** **Fiber Chemistry:** Classification of natural and synthetic fibers (cotton, wool, silk, polyester, nylon, acrylic), Chemical structure of fibers and their relation to properties Textile Wet Processing, introduction to dyes, identification of fibers and dyes **Paper making chemistry-** Pulping, Kraft process, Sulfite process, Bleaching, Additives and fillers **Keywords/Tags:** natural and synthetic fibers, Wet Processing, dyes, Pulping, Bleaching	9
	Activities: 1. Extraction of Tulsi, Neem, Amla, Haldi 2. Gather data on the processes used to purify zinc both historically and currently. 3. Gather images and records pertaining to the history of two rust-resistant monuments built in India. 4. Gather information about traditional Indian cosmetics knowledge and traditional Indian drug knowledge 5. Collection of Medicinal plants and their uses from nearby area (Herbarium Preparation) 6. Chart preparation of Ancient Indian Scientist in Chemistry and their contribution 7. Field study of BKS in nearby area 8. Educational Tour of Industries and Research Institutes 9. Prepare the Project and Modals related to Ancient Indian chemistry	

Part C-Learning Resources
Text Books, Reference Books, Other resources
Suggested Readings: 1. Traditional Systems of Medicine Hardcover -30 January 2006 by M.Z. Abdin (Author), Y.P. Abrol (Author), ISBN-10 8173197075, Publisher Narosa Publishing House 2. Traditional System of Herbal Drugs Used for Various Aliments Paperback- 19 November 2024 by Priya V (Author), Ragavi K K (Author), Publisher LAP Lambert Academic Publishing 3. TEXTB0OK OF MEDICINAL CHEMISTRY 4ED VOL 1 (PB 2022) by ALAGARSAMY V. | 1 January 2022, Publisher: CBS Publishers & Distributors Pvt. Ltd 4. Textbook Of Medicinal Chemistry Part-I Authors: Dr. Amit G. Nerkar, Dr. Narendra M. Gowekar, Mrs.Trupti Somnath Kajale (shahane), ISBN-13 978-93-95581-67-7 Mahi publication 5. Pollution: Causes, Effects and Control, Roy M. Harrison, Royal Society of Chemistry, 2001 6. A Primer on Earth Pollution: Pollution Types and Disposal, Editors: J. Senthil Kumar, P. Ponmurugan, A. Vinoth Kanna, ISBN: 978-981-14-7653-2 (Print) ISBN: 978-981-14-7655-6 (Online), Year of Publication: 2020 7. Food: The Chemistry of its Components, By Tom Coultate, ISBN: 978-1-83916-814-7, Publication date: 11 Oct 2023, Royal Society of Chemistry 8. Chemical and Functional Properties of Food Components, 4th Edition, Edited By Hanna Staroszczyk, Zdzislaw E. Sikorski, December 19, 2024 9. Textile and Paper Chemistry and Technology, 1 January 1978 by Jett C. Arthur (Editor), Publisher American Chemical Society 10. Historic Textile and Paper Materials: Conservation and Characterization (Advances in Chemistry Series) Hardcover - Import, 1 February 1986 by Howard L. Needles (Editor), Publisher Amer Chemical Society
Suggested equivalent online courses: 1. Medicinal Chemistry By Prof. Harinath Chakrapani ISER Pune https:/onlinecourses.nptel.ac.in/noc20 cv16/ 2, Air Pollution and Control By Prof. Bhola Ram Gurjar IIT Roorkee https://onlinecourses.nptel.ac.in/noc23 cel4/

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Part D-Assessment and Evaluation		
Suggested Continuous Evaluation Methods: **Maximum Marks:** 100 Continuous Comprehensive Evaluation (CCE): 30 University Exam (UE): 70 Time: 03.00 Hours		
Internal Assessment: Continuous Comprehensive Evaluation (CCE):	Class Test	15
	Assignment/Presentation	15
	Total	30
External Assessment: University Exam Section	**Section(A): Short Questions** **Section (B): Very Short Questions** **Section (C) : Long Question**	70

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Part A : Introduction		
Programme: B.Sc (Bioinformatics) Class : I Year Semester: II Session: January - June 2026		
Subject: Chemistry		**Theory/Practical: Practical**
1.	**Course Code**	BSCBI – 203 (P)
2.	**Course Title**	Applied Chemistry (Practical)
3.	**Course Type (Core Course/Elective/Generic Elective/Vocational)**	Minor II
4.	**Pre-requisite (if any)**	To study this course the students must have the subject Chemistry in XII Course or equivalent
5.	**Course Objectives**	1. To prepare talcum Powder 2. To prepare shampoo 3. To prepare enamels 4. To estimate different compounds 5. To Synthesis different Drugs 6. To determine Optical Activity 7. To separate and estimate by Solvent extraction
6.	**Course Outcomes (COs)**	On completion of this course, learners will be able to: CO1. Prepare talcum Powder CO2. Prepare shampoo CO3. Prepare enamels CO4.Estimate different compounds CO5.Synthesis of Different Drugs CO6.Determine Optical Activity CO7.Separate and Estimate Components by Solvent extraction
7.	**Expected Job Role/ Career Opportunity**	• Cosmetic Scientist • Paint & Coating Chemist • Pharmaceutical Scientist • Analytical Chemist • Extraction Specialist • Quality Assurance Manager
8.	**Credit Value**	**Practical** – 1 credit
9.	**Total Marks**	Max. Marks: 100 Min. Passing Marks:35

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Part B- Content of the Course		
Total No. of Lectures- 15 hrs.		
S.No.	**Topics**	**No. of Lectures**
1.	**Preparations** 1. Preparation of Talcum Powder 2. Preparation of Shampoo 3. Preparation of Enamels	**03**
2.	**Estimations** 1. Estimation of Iodine from salt 2. Estimation of sweeteners	**03**
3.	**Synthesis of Drug** 1. Paracetamol 2. Sulphanilamide	**03**
4.	**Colloids** To prepare arsenious sulphide sol and compare the precipitating power of mono-, bi- and trivalent cations. **Optical Activity** 1. Determination of refractive index and specific refraction of given liquids. [Any two liquids from,CCI_4, $CHCI_3$, benzene, xylene, toulene, ethyl alcohol]	**03**
5	**Solvent Extraction** 1.Separation and estimation of Mg(II) and Fe(III) **lon Exchange Method** 1. Separation and estimation of Mg(II) and Zn(II)	**03**
Note	**Students should visit any chemical industry to learn or observe the process and preparations practically and submit the report of that industrial visit also**	
Keywords/Tags: Solvent Extraction, Colloids, Synthesis of drug, Preparation and Estimations		

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Part C-Learning Resources

Text Books, Reference Books, Other resources

Suggested Readings:

Text Books

1.Timir Tripathi Chromatography and Centrifugation Methods Daya Publishing House

2. Prof. Sarin A. Chavhan, Prof. Sushilkumar A. Shinde A Guide to Chromatography Techniques Notion Press

3. Vinay Prabha Sharma Practical Organic Chemistry Pragati Prakashan

4. Dr. M.M.N. "Tandon unified practical chemistry" Shiva Lal Agarwal & co.

5. Sudha Goyal (Author), R. P. Singh V. K. Singh (Author), Prashant Singh Ashish Dwivedi (Author) B.Sc. Chemistry Practical I, Krishna Prakashan Media

6. Reinhart Keese, Martin P. Brändle, Trevor P. Toube Practical Organic Synthesis: A Student's Guide John Wiley & Sons, Inc.,

7. Sudha Goyal B.Sc. Chemistry Practical III Krishna Prakashan Media

8. Furmiss, B.S., Hannaford, A.J., Smith, P.W. G., Tatchell, A.R., "Vogel's Text Book of Practical Organic Chemistry", Pearson Education, 2005, 5h Edn.

9. Gurthu, J.N., Kapoor, R., "Advanced Experimental Chemistry", S. Chand and Co., 1987.

10. Sundaram, S., Krishnan, P., Raghavan, P.S., "Practical Chemistry (Part I)", S. Viswanathan Co. Pvt., 1996.

11. Mohd A A, Ranmesh K P, Anuradha S, Bassa S, Advanced Laboratory Techniques in Chemistry, Scientific International Publishing house, Tamilnadu, 2024

Reference Books

12. Furniss, B.S., Hannaford, A.J., Smith, P.W. G., Tatchell, A.R., "Vogel's Text Book of Practical Organic Chemistry", Pearson Education, 2005, 5h Edn.

Suggestive digital platforms web links

13. https://vlab.amrita.edu/?sub=2&brch=190&sim=338&cnt=1
14. http:l/www.columbia.edu/itc/barnard/biology/biobc2004/edit/experiments/Experiment1-Spec.pdf
15. http:l/web.pdx.edu/~ralfw/uploads/1/0/2/6/10260941/pulse oximetry laboratory guide.pdf
16. https://www.chem.purdue.edu/courses/chm224/Lab-Experiments/expt4 GENESYS V2.pdf
17. http:llgervind.faculty.mic.edu/biology 101/101 lab/spectrophotometry/4%20Spectrophotometer%20Fa17.pdf
18. https://www.edag.com/w/images/6/6e/EXPO11 The pH Electrode and Potentiometric Titrations PDF.pdf
19. https://www.philadelphia.edu.jo/academics/ajaber/uploads/CHEM%20540-Chapter%202-Potentiometry-061.pdf
20. https://www.tau.ac.il/~advanal/PotentiometricTitrations.htm
21. https://chem.libretexts.org/Bookshelves/Analytical Chemistry/Book%3A Analytical Chemistry
22. (Harvey)/11%3A Electrochemical Methods/11.02%3A Potentiometric Methods
23. https://www.chem.purdue.edu/courses/chm224/Lab-Experiments/Exp8.pdf
24. https://www.shcollege.ac.in/wp-content/uploads/NAAC Documents IV Cycle/Criterion-I/2.3.2/ppt/Dr Ignatious ConductometricTitration.pdf

25. https://www.analytik.ethz.ch/praktika/phys anal/POL/Anleitung ENG.pdf
26. https://nph.onlinelibrary.wiley.com/doi/pdf/10.1111/.1469-8137.1948.tb05089.xation
27. http:llchemistry.du.ac.in/study material/4103-A/MSc Polarography.pdf
28. https://fac.ksu.edu.sa/sites/default/files/abbe experiment.pdf
29. https://web. mst.edu/~tbone/subjects/tbone/chem224/riproc.pdf
30. http:l/www.fbml.ff.vu.It/sites/default/files/7 4 en.pdf
31. https://wp.optics, arizona.edu/mnofziger/wp-content/uploads/sites/31/2016/05/OPTI202L-Lab10-0MD2.pdf
32. http://davjalandhar.com/dbt/chemistry/SOP%20LabManuals/B.Sc.%20BT%20SEM%20|V.pdf
33. https://vlab.amrita.edu/?sub=1&brch=195&sim=5458cnt=1

Suggested equivalent online courses:

1. https:/www.my-mooc.comlen/mooc/basic-analytical-chemistry/
2. https://www.my-mooc.com/en/mooc/principles-electronic-biosensors-purduex-nano535x/

Part D-Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks:	100
Continuous Comprehensive Evaluation (CCE)	30
University Exam (UE)	70

Internal Assessment Continuous Comprehensive Evaluation (CCE) : 30	**Marks**	**External Assessment**	**Marks**
Class Interaction/Quiz	10	Viva Voce Practical	10
Attendance		Practical Record File	
Assessments (Charts/Model/Seminar/Rural Service/ Technology/ Dissemination/Report of Excursion/ Lab Visits/ Survey/Industrial Visit)	10 10	Table work/ Experiments	10 50
	Total Marks:100		

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PART-A : Introduction			
Programme : B.Sc./BCA/BBA /BBA FT/BBA HA			
Class : I Year	**Semester : II**	**Session : January - June 2026**	
Subject : Ability Enhancement Course		**Theory / Practical: Theory**	
1.	**Course Code**	AEC – 201	
2.	**Course Title**	English Language and Indian Culture	
3.	**Course Type**	Ability Enhancement Course	
4.	**Pre-Requisite**	Not Required	
5.	**Course Objectives**	1. To imbibe values which make students aware of national heritage and making them responsible citizens. 2. To critically read texts to identify main ideas, infer meanings, and assess the author's purpose. 3. To use grammar and vocabulary effectively for communication. 4. To write appropriate correspondence and reports for various professional and social contexts. 5. To prepare students for various competitive exams by developing English Language competence.	
6.	**Course Outcomes (COs)**	On completion of this course, learners will be able to: CO1. Imbibe values which make them aware of national heritage and making them responsible citizens. CO2. Critically read texts to identify main ideas, infer meanings, and assess the author's purpose. CO3. Use grammar and vocabulary effectively for communication. CO4. Write appropriate correspondence and reports for various professional and social contexts. CO5. Prepare for various competitive exams by developing their English Language competence.	
7.	**Expected Job Role/career opportunities**	• Content Writer • Copy Editor • Proofreader • Corporate Communication Executive • Customer Relationship Executive	
8.	**Credit Value**	**Theory –** 2 Credits	
9.	**Total Marks**	**Max. Marks:** 100	**Min. Passing Marks:** 35

PART B: Content of the Course (Theory)		
Total No. of Lectures: 30 Hrs.		
Unit	**Topics**	**No. of Lectures**
I	**Understanding Indian Culture** 1. Rabindranath Tagore "Where the mind is without fear" 2. Swami Vivekananda - "Chicago Speech (1893)" 3. R. K. Narayan - "Astrologer's Day" 4. Introduction to Sundarkand of Valmiki's Ramayan 5. A.L Basham: "The wonder that was India" (an excerpt) **Keywords**: Heritage, Diversity, Pluralism, Values, Patriotism, Spirituality, Humanism, Social Harmony, Tradition, Modernity. **Activity:** • Group Discussion on theme - "fearless thinking & nationalism" (Tagore), "religious harmony & tolerance" (Vivekananda), "social observations" (R.K. Narayan). • Creative Expression-Poster or Collage on "What Indian culture means to me," • A short presentation on a specific cultural aspect of the students' home state (e.g., a festival, a craft, a local custom).	12
II	**Comprehension Skills** 1. Reading Techniques: Skimming, Scanning 2. Identifying the Main Idea and Theme 3. Making Inferences and Drawing Conclusions 4. Analysing unseen passages on Indian history, society, and art. **Keywords** - Inference, Main Idea, Theme, Tone, Purpose, Context Clues, Summary, Paraphrasing, Critical Reading **Activity:** • Worksheets with unseen passages followed by questions on comprehension, vocabulary, and inference. • Summarizing articles from newspapers or magazines on cultural or social issues in India.	02

III	**Basic Language Skills** **Grammar:** 1. Parts of Speech 2. Articles 3. Subject-Verb Agreement 4. Tenses and their application **Vocabulary:** 1. Synonyms, Antonyms, Homonyms, and Homophones 2. One-word substitutes 3. Word formation: Suffixes and Prefixes **Keywords-**Tense, Agreement, Clause, Phrase, Synonym, Antonym, Prefix, Suffix. **Activity:** • Grammar exercises (fill-in-the-blanks, error correction, sentence transformation). • Vocabulary-building games and quizzes.	08
IV	**Writing Skills** 1. The Writing Process: Pre-writing, Drafting, Revising, and Editing 2. Paragraph Writing: Structure, Topic Sentence, and Coherence. 3. Letter writing: Formal/Informal **Keywords:** Cohesion, Coherence, Topic Sentence, Drafting, Revising. Editing **Activity:** • Paragraph on given topics (e.g., "My Favourite Indian Festival," or "The Importance of Technology in Modern India"). • Letter/Application writing exercises • Essay Writing on contemporary relevant issues.	04
V	**Situational Conversation-Context, Audience, Purpose, Type, Register** 1. Meeting/Greeting - Introducing Self, Introducing people to one another 2. Apologies/Responses 3. Enquiring about a Course/ Requesting Information 4. Agreeing/Disagreeing (with a Proposal) **Keywords** - Register, Tone, Style, Audience, Purpose,-Context, Etiquette, Persuasion.	04

	Activity: • Introducing and Greeting (e.g., formal business meeting, college orientation, conference with a guest speaker, informal club gathering). • Debate-Agreeing & Disagreeing with Proposals - such as: "The college should make attendance optional for lectures."	

Part C-Learning Resources
Text Books, Reference Books, Other resources
1. Tagore,R (1912). Gitanjali (Song Offerings). London: Macmillan. "Where the Mind is Without Fear" is Poem No. 35 in this collection. 2. Complete Works of Swami Vivekananda. Vol. 1. Advaita Ashrama (Publication Department of Ramakrishna Math, Belur Math, Kolkata). 3. Swami Tapasyananda, Sundarkandam of Srimad Valmiki Ramayana, Sri ram Krishna Math, Madras 4. Narayan, R.K. Malgudi Days. Indian Thought Publications; Ist edition (11 December 2019); ISBN-10: 9788185986173 5. Cultural Heritage of India by S. Radhakrishnan & Haridas Bhattacharyya (ed.) 6. A Course in English Grammar and Composition by Geetha Nagaraj 7. Functional English by Dr. P. Kiranmai Duit & Geetha Rajeevan (Foundation Books/Cambridge India) 8. Communicative English by E. Suresh Kumar, P. Srechari, and J. Savithri (Orient Black Swan) 9. Practical English Usage by Michael Swan (Oxford) 10. Modern English Grammar by N.Krishnaswany, Macmillion Publication 11. Developing Reading Skills: A Practical Guide to Reading Comprehension Exercises" by Francoise Grellet (Cambridge) 12. Writing Skills by Norman Coe, Robin Rycroft & Pauline Ernest (Cambridge)
Suggested Equivalent Online Course 1. NPTEL Course-"Communication Skills" (by IIT Kharagpur) https://nptel.ac.in/courses/109/106/109106175/ 2. Swayam Course - "English Language for Competitive https://onlinecourses.nptel.ac.in/noc23_hs51/preview Exargs" (by IIT Madras 3. British Council India - "Learn English: Speaking and Writing Skills" https://www.britishcouncil.in/english/courses-adults/learnonline 4. Coursera "Write Professional Emails in English" (by Georgia Tech) https://www.coursera.org/learn/professional-emails-english

Part D- Assessment and Evaluation		
Suggested Continuous Evaluation Methods: Maximum Marks : 100 Marks		
External Assessment: University Exam Section: Time : 03.00 Hours	**Section (A):** Very Short Questions (50 Words)	5*4=20
	Section (B): Short Questions (200 Words)	5*10=50
	Section (C): Long Questions (500 Words)	2*15=30

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PART – A: Introduction			
Programme: B.Sc./BCA/BBA /BBA FT/BBA HA **Class: I Year** **Semester: II** **January-June 2026**			
Subject: Value Added Course (VAC)		**Theory / Practical: Theory**	
1.	**Course Code**	VAC – 201	
2.	**Course Title**	भारत बोध (Understanding India)	
3.	**Course Type (Core Course/DSE/Minor/MD-ID/SEC/VOC)**	VAC	
4.	**Pre-Requisite (if any)**	Class 12th Pass	
5.	**Course Objectives**	1. To develop a fundamental understanding of India's historical, cultural, and Constitutional Nature (Sanvidhanik Swaroop)**.** 2. To develop awareness among students towards the Indian education system, the tradition of knowledge, and national values. 3. To help students understand the India's independence movement, democratic development, and global role. 4. To make students responsible citizens by providing knowledge of the rights and duties enshrined in the Constitution.	
6.	**Course Outcomes (COs)**	On completion of the course, learners will be able to: CO1. Develop a fundamental understanding of India's historical, cultural, and social diversity. CO2. Develop awareness towards the Indian knowledge tradition and national values. CO3. Understand the India's independence movement, development journey, and global role. CO4. Become responsible citizens by acquiring knowledge of the rights and duties enshrined in the Constitution.	
7.	**Expected Job Role / Career Opportunities**	• Civil service candidates • Social workers • Journalists/media professionals • Counselors/motivational trainers • Legal assistants	
8.	**Credit Value**	2 Credits	
9.	**Total Marks**	**Max. Marks:** 100	**Min. Passing Marks:** 35

PART – B: Content of the Course		
No. of Lectures per week: 02 Hours per week)		
Total No. of Lectures Required: T: 30 Hours		
Unit	**Topics**	**No. of Lectures**
I	**Indian History and Cultural Heritage** Characteristics of the Sindhu, Vedic, and Classical periods Indian concepts of co-existence and diversity Cultural Symbols: Religious architecture, music, dance and folk traditions Modern relevance of texts such as "Vasudhaiva Kutumbakam" and "Sarve Bhavantu Sukhinah" **Activity:** The program "Dialogue with the People"-discussion and note-taking about traditional lifestyle-values and knowledge from an elder of the family or community **Assignment:** Write a short essay (about 500 words) with pictures on any cultural heritage/festival/folk art of your village or town.	**06**
II	**Indian Constitution and Civic Duties** The Vedic Concept of State Duties(Vedic Rajdharma) and the modern Constitution Fundamental Rights and Duties: Dharma-Kartavya-Naitikta Youth citizens and their democratic participation Role of Education to Nation-Building **Activity:** "Public Policy Dialogue" – Organizing a Mock Constituent Assembly among students, where the fundamental values of India are presented and discussed. **Assignment 1:** Analyze any one fundamental right and its related duty from a Vedic/classical perspective. **Assignment 2:** Write an essay (400 words) on the role of youth in Indian democracy, from the perspective of "From Swaraj to Suraj".	**06**

III	**Indian Knowledge Tradition and Educational Perspective** Sources of Indian knowledge: Vedas, Upanishads, Philosophy, Smriti, Folk literature Gurukul Tradition: Student-centered learning, oral tradition, and memory-based learning Purpose of Education: Self-realization (Atmokarsha) and social welfare (Lokasangraha) Role of the Teacher: "Acharya Devo Bhava"- character building and contribution to social reconstruction **Activity 1:** Knowledge-sharing session: Demonstration of traditional teaching methods (dialogue, memorization-based learning). **Activity 2:** Recreation of Shlokas and meaning- based discussion - Especially from Shikshavalli and Bhagavad Gita etc. **Assignment 1:** Explain the objectives of Indian education based on any Vedic hymn or Upanishadic statement. **Assignment 2:** Write a short essay on examples of Guru–Shishya tradition or life values observed in your school, village, or family.	**06**

IV	**India's Philosophy of Life and the Concept of a Sustainable Future** Indian Life Perspective: Purusharth Chatushtaya, Ashrama system, Duty-Based Ethics Harmony with Nature: Yagya, Panchamahabhutas, ecological cycle and environmental balance Indian Economic Thought: Arthashastra, Swadeshi, labour culture, and public sector enterprises Indian Concept of Sustainable development and environmental balance **Activity 1:** Poster or slogan writing on "Simple Living, High Thinking" **Activity2:**Group presentation on Indian environmental traditions (yagya, tree worship, river, festivals, etc.) **Assignment 1:** Panchamahabhutas and Indian life perspective **Assignment 2:** Journey from 'Swadeshi' to 'Atmanirbhar Bharat' (Self-reliant India)	**06**
V	**Contemporary India and Global Role** Role of Religious, Cultural, and Intellectual Leadership in the Indian independence movement India's contributions: Space science, Yoga, diplomacy, peace philosophy Atmanirbhar Bharat: Integration of tradition and innovation India's soft power in the global context and its role in a multipolar world **Activity 1:** Student presentation on policy alternatives (Indian Model vs Western Model) **Activity 2:**Essay writing on the theme *"India @ 2047"* **Assignment 1:** Global India and Possibilities of Cultural Leadership **Assignment 2:**Technology and Ethics: Exploring the Indian Model of Integration	**06**

Part – C: Learning Resources
Textbooks, Reference Books, Other Resources
Suggested Readings: 1. Katdre, Indumati – Bharatiya Shiksha: Sankalpana evam Swaroop/ Punarsrijan, Prakashan Seva trust, Ahmedabad 2. Kumar, Krishan – PrachinBharatiya Shiksha Paddhati, Shri Saraswati Sadan, Delhi 3. Saluja, Chand Kiran (2023) – Shiksha: BharatiyaPariprekshya Sanskrit Samvardhan Pratishthan, New Delhi 4. Kapoor, Kapil & Singh, Avdhesh Kumar (Editor), (2005) – **Indian Knowledge Systems** (Khand 1-2) Indian Institution of Advance Study, Shimla; D.K. Printworld, New Delhi
Textbooks: 1. Swaroop, Devendra – Sanskriti: Ek Naam – Roop, Anek Pratiman Pratibha Prakashan, New Delhi 2. Swaroop, Devendra (Editor), (2010) – Rashtriya Shiksha Andolan ka Itihas (Hindi Sanskaran) Prabhat Pratisthan, New Delhi 3. Agrawal, Vasudev Sharan (Editor), (2023) – Rashtra, Dharma aur Sanskriti (Nibandh Sanchayan). Prabhat Prakashan, New Delhi
Reference Books: 1. Mishra, Rameshwar Pankaj (2024) – Advitiya samajshastra, Prabhat Prakashan, New Delhi 2. Pandey, Om Prakash (Editor) (2023) – Bharat Vaibhav, Rashtriya Pustak Nyas (NBT) , New Delhi 3. Subbarayappa, B.V. – Bhartiya Vigyan Parampara, Rashtriya Pustak Nyas (NBT) , New Delhi
Suggestive Digital Platform Web Links: ● https: //www.youtube.com/watch?v=VUOyldPx8h4 ● https://www.youtube.com/watch?v=1livkUGjeFA&list=PLfGFNx UDX0eholQwKZ2ekqaxY3PDtoDq-&index=4 ● https://www.youtube.com/watch?v=SuMnvLxc9ic ● https://www.youtube.com/watch?v=iPuRqFlmoSc ● https://www.youtube.com/watch?v=YZQeUq5d48Q&list=PL_a1TI5CC9RG8w PaNNDOk6VjSdhe0K3HE&index=6 ● https: //www.youtube.com/watch?v=9PLs_N6WbxE

Part – D: Assessment and Evaluation		
Only External Assessment		**Total Marks:** 100
External Assessment **End Semester Exams** **Time: 03 Hours**	(A) Five Short Answer Type Questions (B) Five Long Answer Type Questions	**Total Marks:** 100
Total Marks	100	
Credit Value	02	
Minimum Passing Marks	35	

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भाग अ : परिचय		
कार्यक्रम : **बी.एस.सी./बी.सी.ए/बी.बी.ए./बी.बी.ए. एफ. टी./बी.बी.ए. एच.ए.**		
कक्षा : **I वर्ष**	**सेमेस्टरः II**	**सत्र: जनवरी – जून 2026**
विषयः **Value Added Course (VAC)**		**Theory/ Practical: Theory**
1.	पाठ्यक्रम कोड	VAC – **201**
2.	पाठ्यक्रम शीर्षक	भारत बोध (Understanding India)
3.	पाठ्यक्रम प्रकार (कोर कोर्स / वोकेशनल) डीएसई / माइनर / एमडी–आईडी / एसईसी / वीओसी)	VAC
4.	पूर्वापेक्षा (यदि कोई हो)	कक्षा 12 वी उतीर्ण
5.	पाठ्यक्रम का उद्देश्य	1. भारत के ऐतिहासिक, सांस्कृतिक और सवैधानिक स्वरूप की मूलभूत समझ विकसित करना। 2. भारत शिक्षा पद्धति, ज्ञान परंपरा और राष्ट्रीय मूल्यों के प्रति छात्रों में संवेदनशीलता उत्पन्न करना। 3. भारत की स्वतंत्रता संग्राम, लोकतांत्रिक विकास और वैश्विक भूमिका को समझने में सहायता करना। 4. संविधान में निहित दायित्वों एवं आधिकारों की जानकारी देकर छात्रों को जिम्मेदार नागरिक बनाना।
6.	पाठ्यक्रम अध्ययन की उपलब्धियां (कोर्स लर्निंग आउटकम)	इस कोर्स का अध्ययन करने के बाद विद्यार्थी में, 1. विद्यार्थी भारत की ऐतिहासिक,सांस्कृतिक और सामाजिक विविधता की मूलभूत समझ विकसित कर सकेंगे। 2. विद्यार्थी भारतीय ज्ञान परंपरा और राष्ट्रीय मूल्यों के प्रति संवेदनशीलता विकसित कर सेकेंगे। 3. विद्यार्थी भारत के स्वतंत्रता संग्राम, विकास यात्रा और वैश्विक भूमिका को समझ सकेंगे। 4. विद्यार्थी संविधान में निहित अधिकारों एवं कर्तव्यों का ज्ञान प्राप्त कर जिम्मेदार नागरिक बन सकेंगे।
7.	संभावित नौकरी भूमिकाएँ/ करियर अवसर	• सिविल सेवा अभ्यर्थी • सामाजिक कार्यकर्ता • पत्रकार / मीडिया प्रोफेशनल • काउंसलर / मोटिवेशनल ट्रेनर • कानून से जुड़े सहायक कार्य

8.	क्रेडिट मान	02	
9.	कुल अंक	अधिकतम अंकः 100	न्यूनतम अंकः 35

भाग ब–पाठ्यक्रम सामग्री	
प्रति सप्ताह कक्षाओं की संख्याः 2 घंटे प्रति सप्ताह	
आवश्यक व्याख्यानों की कुल संख्या : थ्योरी (T) 30 घंटे	
ईकाई	विषय
I	**भारतीय इतिहास और सांस्कृतिक विरासत** • सिन्धु, वैदिक, और शास्त्रीय काल की विशेषताएँ • सह–अस्तित्व और बहुलता की भारतीय अवधारणा • सांस्कृतिक प्रतीक : धर्म स्थापत्य, संगीत, नाट्य, लोकाचार • 'वसुधैव कुटुम्बकम्', 'सर्वे भवन्तु सुखिनः' जैसे सूत्रों की आधुनिक प्रासंगिकता **गतिविधियां :** • 'लोक से संवाद' कार्यक्रम–परिवार या समुदाय के किसी बुजुर्ग से पारंपरिक जीवन–मूल्य एवं ज्ञान पर चर्चा, और उसका लेखा–जोखा। **असाइनमेंट विषयः** • अपने गाँव या नगर की किसी स्थानीय सांस्कृतिक धरोहर/पर्व/लोककलाओं का लघु लेख चित्रों सहित तैयार करें (500 शब्द)।
II	**भारतीय संविधान और नागरिक दायित्व** • वैदिक राजधर्म और आधुनिक संविधान • मूल अधिकार और कर्तव्य : धर्म–कर्तव्य – नैतिकता • युवा नागरिक और लोकतांत्रिक भागीदारी • शिक्षा का राष्ट्रनिमार्ण में योगदान **गतिविधियॉः** • 'जननीति संवाद'–छात्रों के बीच मॉक संविधान सभा या युवा संसद का आयोजन, जिसमें भारत के मूल मूल्य प्रस्तुत करें। **असाइनमेंट विषयः** • किसी एक मौलिक अधिकार और उससे जुडे कर्तव्य का वैदिक/शास्त्रीय दृष्टिकोण से विश्लेषण करें। • भारतीय लोकतंत्र में युवाओं की भूमिका पर 'स्वराज से सुराज तक' दृष्टिकोण में निबंध (400 शब्द)

III	**भारतीय ज्ञान परंपरा और शिक्षा दृष्टिकोण** • भारतीय ज्ञान के स्त्रोत : वेद, उपनिषद, दर्शन, स्मृति, लोक साहित्य • गुरूकुल परंपराः शिष्य–केंद्रित शिक्षण, वाचिक परंपरा और स्मृति आधारित अधिगम • शिक्षा का उद्देश्य : आत्मोत्कर्ष एवं लोकसंग्रह • शिक्षक की भूमिका 'आचार्य देवो भवः'चरित्र निमार्ण, सामाजिक पुननिर्माण में योगदान **गतिविधियाँः** • ज्ञानवार्ता गोष्ठी–शास्त्रीय शिक्षा पर आधारित शिक्षण पद्धति (उदाहरणः संवाद, स्मृति आधारित अभ्यास) का डेमो प्रस्तुत करना। • श्लोक–गायन और उसका अर्थाथ संवाद–विशेष रूप से शिक्षावल्ली (तैतिरीयोपनिषद), गीता आदि से। **असाइनमेंट विषयः** • किसी वैदिक ऋचा या उपनिषद वाक्य के आधार पर भारतीय शिक्षा के उद्देशय का विवेचन करें। • अपने विद्यालय/ग्राम/परिवार में देखे गए गुरू–शिष्य परंपरा या जीवन–परमार्थ के उदाहरण पर लघु लेख।
IV	**भारत का जीवन – दर्शन और सतत भविष्य की अवधारणा** • भारतीय जीवन –दृष्टिः पुरुषार्थ चतुष्टय, आश्रम व्यवस्था और कर्तव्य आधारित नैतिकता • प्रकृति के साथ सामंजस्यः यज्ञ, पंचमहाभूत ऋतुचक्र और पर्यावरण संतुलन • भारतीय अर्थदर्शनः अर्थशास्त्र , स्वदेशी , श्रम–संस्कृति और लोक–उद्यम • सतत विकास और पर्यावरणीय न्याय की भारतीय अवधारणा **गतिविधियाँः** • 'सादा जीवन उच्च विचार' विषय पर पोस्टर या स्लोगन लेखन • भारतीय पर्यावरणीय परंपराओं (जैस यज्ञ, वृक्ष–पूजन, नदी महोत्सव आदि) पर समूह प्रस्तुति **असाइनमेंट विषयः** • पंचमहाभूत और भारतीय जीवन–दृष्टि • स्वदेशी से 'आत्मनिर्भर भारत' तक की यात्रा

V	**समकालील भारत और वैश्विक भूमिका** • स्वतंत्रता संग्राम में धार्मिक, सांस्कृतिक और बौद्धिक नेतृत्व की भूमिका • भारत का योगदानः अंतरिक्ष विज्ञान, योग, कूटनीति, शांति दर्शन • 'आत्मनिर्भर भारत' परंपरा और नवाचार का समन्वय • वैश्विक परिप्रेक्ष्य में भारत 'सॉफ्ट पावर',बहुध्रुवीय विश्व में भूमिका **गतिविधियाँः** • छात्रों द्वारा नीति – विकल्प प्रस्तुत करना (Indian Model vs Western Model) • "भारत @ 2047" विषय पर निबंध **असाइनमेंट विषयः** • "ग्लोबल भारत और सांस्कृतिक नेतृत्व की संभावना" • "तकनीक और नैतिकता : भारतीय समन्वय की खोज"

भाग–सः अध्ययन संसाधन
पाठ्यपुस्तकें, संदर्भ पुस्तकें, अन्य संसाधन
अनुशंसित पाठ्यसामग्री 1. काटदरे, इंदुमति। भारतीय शिक्षा : संकल्पना एवं स्वरूप/ पुनरूत्थान प्रकाशन सेवा ट्रस्ट, अहमदाबाद। 2. कुमार, कृष्ण। प्राचीन भारतीय शिक्षा पद्धति। श्री सरस्वती सदन, दिल्ली। 3. सलूजा, चंद किरण (2023)। शिक्षाः भारतीय परिप्रेक्ष्य। संस्कृत संवर्धन प्रतिष्ठान, नई दिल्ली। 4. कपूर, कपिल एवं सिंह, अवधेश कुमार(संपादक)। (2005)। Indian Knowledge Systems (खंड 1–2)। इंडियन इंस्टिट्यूट ऑफ एडवांस्ड स्टडी, शिमला; डी.के. प्रिंटवर्ल्ड, नई दिल्ली।
पाठ्यपुस्तकें: 1. स्वरूप, देवेद्र। संस्कृति एकः नाम–रूप अनेक प्रतिभा प्रकाशन, नई दिल्ली। 2. स्वरूप, देवेद्र। (संपादक)। (2010)। राष्ट्रीय शिक्षा आंदोलन का इतिहास (हिंदी संस्करण)। प्रभात प्रतिष्ठान, नई दिल्ली। 3. अग्रवाल, वासुदेव शरण (संपादक)। (2023)। राष्ट्र, धर्म और संस्कृति (निबंध संचयन)। प्रभात प्रकाशन, नई दिल्ली।
संदर्भपुस्तकें: 1. मिश्र, रामेश्वर 'पंकज '(2024)। अद्वितीय समाजशास्त्र। प्रभात प्रकाशन, नई दिल्ली। 2. पाण्डेय, ओम प्रकाश (संपादक)। (2023)। भारत वैभव। राष्ट्रीय पुस्तक न्यास (एनबीटी),नई दिल्ली। 3. सुब्बारायप्पा, बी.वी.। भारतीय विज्ञान परंपरा। राष्ट्रीय पुस्तक न्यास (एनबीटी), नई दिल्ली।

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ISO 9001:2015 Certified

अनुशंसित डिजिटल प्लेटफॉर्म वेब लिंकः

- https: //www.youtube.com/watch?v=VUOyldPx8h4
- https://www.youtube.com/watch?v=1livkUGjeFA&list=PLfGFNx UDX0eholQwKZ2ekqaxY3PDtoDq-&index=4
- https://www.youtube.com/watch?v=SuMnvLxc9ic
- https://www.youtube.com/watch?v=iPuRqFlmoSc
- https://www.youtube.com/watch?v=YZQeUq5d48Q&list=PL_a1TI5CC9RG8wPaNNDOk6 VjSdhe0K3HE&index=6
- https: //www.youtube.com/watch?v=9PLs_N6WbxE

भाग–दः आकलन एवं मूल्यांकन		
केवल बाह्य मूल्याकंन		कुल अंकः 100
बाह्य मूल्यांकन अंतिम सेमेस्टर परीक्षा समयः 03 घंटे	(अ) पांच लघु प्रश्न (ब) पांच दीर्घ उत्तरीय प्रश्न	कुल अंकः 100
अधिकतम अंक	100	
क्रेडिट मान	02	
न्यूनतम उर्त्तीण अंक	35	