

FOUR YEAR UNDERGRADUATE PROGRAM (NEP-2020)

Program: Bachelor in Life Sciences (2024 -28)

DISCIPLINE –BIOTECHNOLOGY

Session – 2024 -25

DSC -01 to 08		DSE -01 to 12		DGE -01 & 02	
Code	Title	Code	Title	Code	Title
BTSC -01T	Cell Biology & Biochemistry	BTSE - 01T	Environmental Biotechnology	BTGE -01T	Cell Biology & Biochemistry
BTSC -01P	Lab course	BTSE - 01P	Lab course	BTGE -01P	Lab course
BTSC -02T	Microbiology & Molecular Biology	BTSE - 02T	Bioprocess engineering	BTGE -02T	Microbiology & Molecular Biology
BTSC -02P	Lab course	BTSE - 02P	Lab course	BTGE -02P	Lab course
BTSC -03T	Genetics & Biophysics	BTSE - 03T	Industrial Biotechnology		
BTSC -03P	Lab course	BTSE - 03P	Lab course		
BTSC -04T	Recombinant DNA technology	BTSE - 04T	Medical Biotechnology		
BTSC -04P	Lab course	BTSE - 04P	Lab course		
BTSC -05T	Enzymology	BTSE - 05T	Genomics		
BTSC -05P	Lab course	BTSE - 05P	Lab course	SEC	
BTSC -06T	Immunology	BTSE - 06T	Proteomics	BTSEC-01	Biopesticides & Biofertilizers
BTSC -06P	Lab course	BTSE - 06P	Lab course		
BTSC -07T	Plant & Animal Biotechnology	BTSE - 07T	Agricultural Biotechnology		
BTSC -07P	Lab course	BTSE - 07P	Lab course	VAC	
BTSC -08T	Biostatistics & Bioinformatics	BTSE - 08T	Pharmaceutical Biotechnology	BTVAC-01	Plants-based Secondary Metabolites

Officer-In-Charge (Academic)
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Chairman
of Studies
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DR-1

BTSC -08P	Lab course	BTSE - 08P	Lab course		
		BTSE - 09T	Microbial Products for Human Consumption		
		BTSE - 09P	Lab course		
		BTSE - 10T	Microbial Products for Agriculture		
		BTSE - 10P	Lab course		
		BTSE - 11T	Microbial Products for Industrial uses		
		BTSE - 11P	Lab course		
		BTSE - 12T	IPR, Biosafety & Bioethics		
		BTSE - 12P	Lab course		

Program Outcomes (PO):

- 1) The student will develop competency to explore natural resources with scientific validation.
- 2) Multifold skills will be developed for their entrepreneurship competency and self-reliance.
- 3) The program will ensure scientific competency, research aptitude, and competency for the promotion of the future of the nation.

Program Specific Outcomes (PSO): (If any)

- 1) The graduates will be competent for sustainable scientific exploration in the field of agriculture, medicine, food and environment.
- 2) The program will integrate traditional and modern knowledge to meet the challenges of the future by the help of genomics, proteomics, bioprocess engineering and biotechnological tools for environmental corrections.

Name and Signature of Convener and Members of CBOS:

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(Kishan Kant Sahi)
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(Amrit Pando)
Shivani
Dr. Shivani Sharma

Neha
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Shubha
CD. Shubha
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Dr. Pramod Malish

Dr. Anurag
(Dr. Anurag)

Four Year Undergraduate Program (2024-28)
Department of Biotechnology
Course Curriculum

Part A: Introduction		
Program: Bachelor in Life Sciences (Certificate/Diploma/Degree/Honors)	Semester: I Sem	Session: 2024-2025
1	Course Code	BTSC-01-T
2	Course Title	Cell Biology and Biochemistry
3	Course Type	Discipline Specific Course (DSC)
4	Pre-requisite (if any)	As per program
5	Course Learning Outcomes (CLO)	After completing this course, the students will be able to – <ul style="list-style-type: none"> • Explore and validate the Indian knowledge system and its significance in the field of biotechnology. • Understand cellular organization, their division for the continuation of life, and the natural cellular death mechanism. • Understand the basic biochemicals for organizational and functional expression of life. • Understand the metabolic regulations for survival and continuation of life.
6	Credit Value	03 Credits (Credit = 15 Hours - learning & observation)
7	Total Marks	Max. Marks: 100 Min Passing Marks: 40

Part B: Content of Course (Theory)		
Total No. of Teaching-learning Periods (01 Hr. per period)- 45 Periods (45 Hours)		
Unit	Topic (Course content)	No. of Period
I	Basics and IKS <ol style="list-style-type: none"> 1. The modern concept of the origin of life. 2. Contribution of Indian scientists in biology. 3. Significance of ancient Indian knowledge system in medical science. 4. Structure of cell. 	12 (12 Hrs)
II	Cell structure and division <ol style="list-style-type: none"> 1. Ultrastructure of cell organelles. 2. Ultrastructure of chromosomes. 3. Cell division- Mitosis and meiosis. 4. Biology of cancer cells and apoptosis. 	11 (11 Hrs)
III	Basics of biochemistry <ol style="list-style-type: none"> 1. Carbohydrates- Structure and classification. 2. Lipid- Structure and classification. 3. Amino acids - Structure and classification. 4. Three-dimensional structure of proteins. 	11 (11 Hrs)
IV	Metabolism <ol style="list-style-type: none"> 1. Enzymes- Nomenclature and classification, mechanism of action, and factors affecting enzyme action. 2. Carbohydrate metabolism- Glycolysis, Krebs cycle, gluconeogenesis, glycogenesis. 3. Lipid metabolism- Beta oxidation of fatty acids, fatty acid biosynthesis. 4. Protein metabolism- Transamination, deamination, and synthesis of amino acids. 	11 (11 Hrs)

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	acids.	
Keywords	Cell, Biomolecules, Cell Division.	

• Part C - Learning Resource	
Text Books, Reference Books, Other Resources -	
<ul style="list-style-type: none"> ➤ Text Book- ➤ Biotechnology- U Satyanarayana. ➤ Cell Biology- C B Powar ➤ Cell and Molecular Biology- P K Gupta 	
Reference Book-	
<ul style="list-style-type: none"> • Practical Biochemistry- Wilson & Walker. ○ Cell biology – C.B.Powar ○ Molecular Biology of the Cell – Alberts ○ Molecular Cell Biology – Lodish ○ Cell and Molecular Biology – Gerald Karp ○ The Cell – Cooper ○ Lehninger- Principles of Biochemistry ○ Nelson & Cox. - Biochemistry ○ Voet & Pratt. - Biochemistry 	
Online resources-	
<ul style="list-style-type: none"> ➤ https://onlinecourses.nptel.ac.in/noc22_cy06/preview ➤ https://nptel.ac.in/courses/104105076 	

Part D: Assessment and Evaluation			
Suggested Continuous Evaluation Methods:			
Maximum Marks:	100 Marks		
Continuous Internal Assessment (CIA):	30 Marks		
End Semester Exam (ESE):	70 Marks		
Continuous Internal Assessment (CIA) (By course teacher):	Internal Test / Quiz-(2): Assignment / Seminar - Total Marks -	20 +20 10 30	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
End Semester Exam (ESE):	Two section – A & B Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 =20.Marks Section B: Descriptive answer type qts., 1out of 2 from each unit-4x10=40 Marks		

Name and Signature of Convener and Members of CBoS:

(Keshav Kumar Singh)
Keshav Kumar Singh

(Ananta Ruder)
Ananta Ruder

(Dr. Neko Behal)
Neko Behal

(Dr. Shubha Dwan)
Shubha Dwan

(Dr. Shirani Sharma)
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(Dr. Sanjane Bhagat)
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(Dr. Vajwade)
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Four Year Undergraduate Program (2024-28)
Department of Biotechnology
Course Curriculum – 2024-28

Part A: Introduction		
Program: Bachelor in Life Sciences (Certificate/Diploma/Degree/Honors)		Session: 2024-2025
1	Course Code	BTSC-02-T
2	Course Title	Microbiology and Molecular Biology
3	Course Type	Discipline Specific Course (DSC)
4	Pre-requisite (if any)	As per program.
5	Course Learning Outcomes (CLO)	After completing this course, the students will be able to - <ul style="list-style-type: none"> • Understand various categories of microbes in the living world. • Develop the capability to culture and maintenance of microbes. • Understand the regulatory mechanism for the precursor of life-DNA • Understand the mechanism of genetic expression for the regulation of life.
6	Credit Value	03 Credits (Credit = 15 Hours - learning & observation)
7	Total Marks	Max. Marks: 100 Min Passing Marks: 40

Part B: Content of Course (Theory)		
Total No. of Teaching-learning Periods (01 Hr. per period)- 45 Periods (45 Hours)		
Unit	Topic (Course content)	No. of Period
I	Maintenance of microbes <ol style="list-style-type: none"> 1. Classification of microorganisms and taxonomy. 2. Molecular basis of microbial taxonomy. 3. Growth media for culture of bacterial, viral, and fungal microbes; sterilization. 4. Isolation, purification, and culture methods of microbes (bacteria, virus, and fungi). 	12 (12 Hrs)
II	Microbial life <ol style="list-style-type: none"> 1. Bacterial reproduction- Conjugation, transduction, and transformation. 2. Mycoplasma- Classification, structure, and pathogenesis. 3. Virus- Structure, classification, multiplication, pathogenesis and bacteriophages. 4. Food and water microbes. 	11 (11 Hrs)
III	Nuclear maintenance and expression <ol style="list-style-type: none"> 1. DNA replication. 2. DNA damage and repair. 3. Transcription in prokaryotes and eukaryotes. 4. Processing of RNA- Capping, polyadenylation, and splicing. 	11 (11 Hrs)
IV	Genetic expression <ol style="list-style-type: none"> 1. Genetic code. 2. Translation in prokaryotes and eukaryotes. 3. Operon concept. 4. Recombination. 	11 (11 Hrs)
Keywords	Microbial taxonomy, RNA, DNA, operon.	

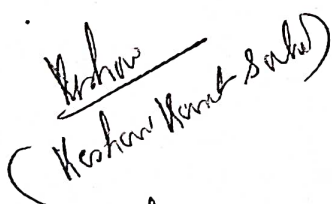
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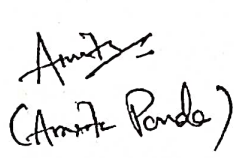
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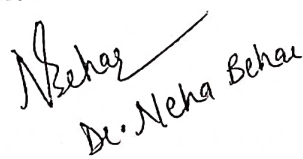
• Part C - Learning Resource	
Text Books, Reference Books, Other Resources -	
Text Books-	
<ul style="list-style-type: none"> ➤ Textbook of Microbiology- A K Kushwaha. ➤ Microbiology – Dr. Preeti Sharma. ➤ Introduction To Medical Microbiology- Ananthnarayana's ➤ Cell and Molecular Biology- P K Gupta 	
Reference Book-	
<ul style="list-style-type: none"> • Molecular Biology; Watson. • Gene VIII; Benjamin Lewin. • The Cell, A molecular Approach; Geoffrey M. Cooper. • Molecular Biology of the Cell; Alberts • Cell and Molecular Biology; Lodish. • Microbiology – Prescott • Microbiology – Pelczar&Pelczar • General Microbiology I and II – Powar and Dagainawala • Microbiology – Tortora. 	
Online resources- https://archive.nptel.ac.in/courses/102/103/102103015/ https://onlinecourses.nptel.ac.in/noc24_bt07/preview	

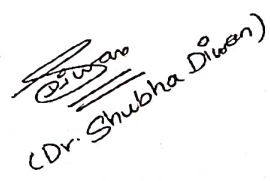
Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks:	100 Marks	
Continuous Internal Assessment (CIA):	30 Marks	
End Semester Exam (ESE):	70 Marks	
Continuous Internal Assessment (CIA) (By course teacher):	Internal Test / Quiz-(2): 20 +20 Assignment / Seminar - 10 Total Marks - 30	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
End Semester Exam (ESE):	Two section – A & B Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 =20 Marks Section B: Descriptive answer type qts., 1out of 2 from each unit-4x10=40 Marks	


Name and Signature of Convener and Members of CBoS:

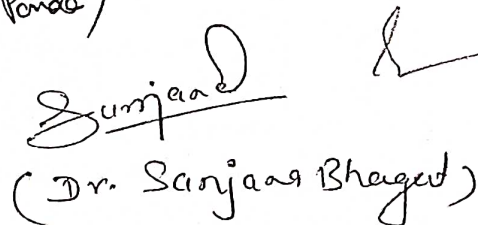

 (Keshav Kumar Sahai)


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Four Year Undergraduate Program (2024-28)
Department of Biotechnology
Course Curriculum

Part A: Introduction		
Program: Bachelor in Life Sciences (Certificate/Diploma/Degree/Honors)		Semester: I Sem Session: 2024-2025
1	Course Code	BTSC-01-P
2	Course Title	Cell Biology and Biochemistry
3	Course Type	Discipline Specific Course (DSC) - Practical
4	Pre-requisite (if any)	As per the program
5	Course Learning Outcomes (CLO)	After completing this practical course, the students will be able to – <ul style="list-style-type: none"> Identify animal and plant cells and its replication. Understand karyogram. Analyze biomolecules. Develop expertise in chromatographic techniques.
6	Credit Value	01 Credits Credit = 30 Hours Laboratory or Field learning/Training
7	Total Marks	Max. Marks: 50 Min Passing Marks: 20

Part B: Content of Course		
Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)		
Module	Topic (Course content)	No. of Period
Lab./Field Training/ Experiment Contents of Course	<ol style="list-style-type: none"> Preparation of mitotic index from plants and animals. Preparation of slide of blood cells. Preparation of slide of giant chromosomes. Preparation of slide of epithelial cells. Biochemical test of carbohydrates. Biochemical test of lipids. Biochemical test of proteins. The action of salivary amylase on starch. The action of trypsin on proteins. Separation of amino acids by chromatography. Separation of chlorophyll by chromatography. 	30
Keywords	Mitotic index, Giant chromosome, biomolecules.	

• Part C - Learning Resource	
Text Books, Reference Books, Other Resources -	
<ul style="list-style-type: none"> Text Book- <ul style="list-style-type: none"> Biotechnology- U Satyanarayana. Cell Biology- C B Powar Cell and Molecular Biology- P K Gupta 	
Reference Book- <ul style="list-style-type: none"> Practical Biochemistry- Wilson & Walker. Cell biology – C.B.Powar 	

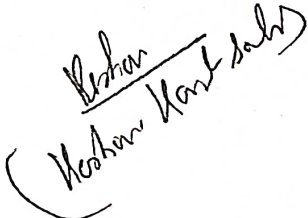
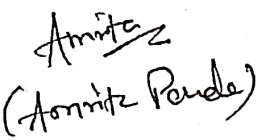
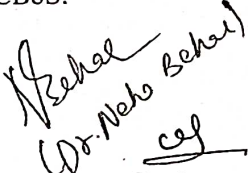
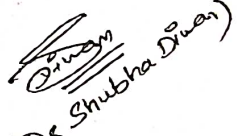
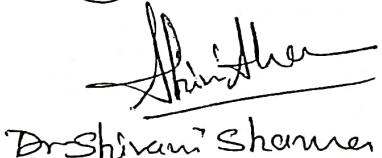
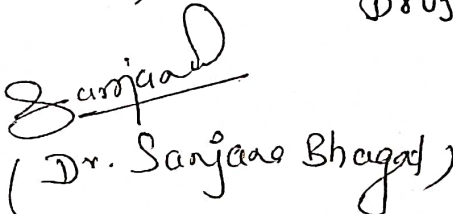
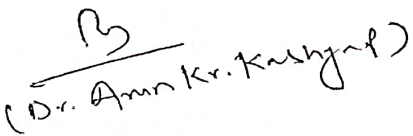
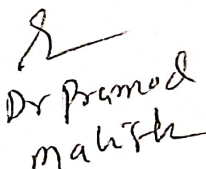
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<ul style="list-style-type: none"> o Molecular Biology of the Cell – Alberts o Molecular Cell Biology – Lodish o Cell and Molecular Biology – Gerald Karp o The Cell – Cooper o Lehninger- Principles of Biochemistry o Nelson & Cox. - Biochemistry o Voet & Pratt. - Biochemistry
Online resources- <ul style="list-style-type: none"> ➤ https://onlinecourses.nptel.ac.in/noc22_cy06/preview ➤ https://nptel.ac.in/courses/104105076

Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks:	50 Marks	
Continuous Internal Assessment (CIA):	15 Marks	
End Semester Exam (ESE):	35 Marks	
Continuous Internal Assessment (CIA) (By course teacher):	Internal Test / Quiz-(2): 10 +10 Assignment / Seminar + Attendance- 05 Total Marks - 15	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
End Semester Exam (ESE):	Laboratory / Field Skill Performance: A. On spot Assessment - 20 B. Spotting based on tools & technology (written) – 10 Marks C. Viva-voce (based on principle/technology) - 05 Marks	Managed by course teacher as per lab status

Name and Signature of Convener and Members of CBoS:


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Four Year Undergraduate Program (2024-28)
Department of Biotechnology
Course Curriculum

Part A: Introduction		
Program: Bachelor in Life Sciences (Certificate/Diploma/Degree/Honors)		Semester: II Sem
		Session: 2024-2025
1	Course Code	BTSC-02-P
2	Course Title	Microbiology and Molecular Biology
3	Course Type	Discipline Specific Course (DSC) - Practical
4	Pre-requisite (if any)	As per program
5	Course Learning Outcomes (CLO)	After completing this practical course, the students will be able to - <ul style="list-style-type: none"> • Maintenance of microbes. • Identification of microbes. • Isolation of nucleic acid from microbes. • Elucidations of nucleic acids of microbes.
6	Credit Value	01 Credits Credit = 30 Hours Laboratory or Field learning/Training
7	Total Marks	Max. Marks: 50 Min Passing Marks: 20

Part B: Content of Course		
Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)		
Module	Topic (Course content)	No. of Period
Lab./Field Training/ Experiment Contents of Course	<ol style="list-style-type: none"> 1. Various techniques for sterilization. 2. Preparation of microbial media. 3. Isolation and culture of microbes from air, soil, and water. 4. Determination of Gram-positive and Gram-negative bacteria. 5. Streak plate method for culturing of microbes. 6. Pour plate method for culturing of microbes. 7. Spread plate method for culturing of microbes. 8. Broth culture method for culturing of microbes. 9. Determination of bacterial growth curve. 10. Isolation of DNA from bacteria. 11. Estimation of DNA. 12. Estimation of RNA. 13. Elucidation of DNA bands by electrophoresis. 	30
Keywords	Microbes, sterilization, RNA, DNA.	

Part C - Learning Resource	
Text Books, Reference Books, Other Resources -	
Text Books- <ul style="list-style-type: none"> ➤ Textbook of Microbiology- A K Kushwaha. ➤ Microbiology – Dr. Preeti Sharma. ➤ Introduction To Medical Microbiology- Ananthnarayana's ➤ Cell and Molecular Biology- P K Gupta 	
Reference Book- <ul style="list-style-type: none"> • Molecular Biology; Watson. • Gene VIII; Benjamin Lewin. 	

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- The Cell, A molecular Approach; Geoffrey M. Cooper.
- Molecular Biology of the Cell; Alberts
- Cell and Molecular Biology; Lodish.
- Microbiology – Prescott
- Microbiology – Pelczar&Pelczar
- General Microbiology I and II – Powar and Dagainawala
- Microbiology – Tortora.

Online resources- <https://archive.nptel.ac.in/courses/102/103/102103015/>
https://onlinecourses.nptel.ac.in/noc24_bt07/preview

Part D: Assessment and Evaluation			
Suggested Continuous Evaluation Methods:			
Maximum Marks:	50 Marks		
Continuous Internal Assessment (CIA):	15 Marks		
End Semester Exam (ESE):	35 Marks		
Continuous Internal Assessment (CIA) (By course teacher):	Internal Test / Quiz-(2):	10 +10	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
	Assignment / Seminar + Attendance-	05	
	Total Marks -	15	
End Semester Exam (ESE):	Laboratory / Field Skill Performance:		Managed by course teacher as per lab status
	A. On spot Assessment -	20 Marks	
	B. Spotting based on tools & technology (written) -	10 Marks	
	C. Viva-voce (based on principle/technology) -	05 Marks	

Name and Signature of Convener and Members of CBoS:

(Neha Nand Sah)
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Amrit
 (Amrit Pande)

Neha
 (Dr. Neha Beha)

Shubra
 (Dr. Shubra Divan)

Shirani
 Dr. Shirani Sharma

Sanjana
 (Dr. Sanjana Bhagat)

Dr. Prasad
 Dr. Prasad Mahesh

Amr
 (Dr. Amr Kr. Kashyap)

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Four Year Undergraduate Program (2024-28)
Department of Biotechnology
Course Curriculum

Part A: Introduction		
Program: Bachelor in Life Sciences (Certificate/Diploma/Degree/Honors)		Semester: II Sem Session: 2024-2025
1	Course Code	BTSEC-01
2	Course Title	Biopesticides and Biofertilizer
3	Course Type	Skill Enhancement Course (SEC)
4	Pre-requisite (if any)	As per requirement.
5	Course Learning Outcomes (CLO)	After completing this course, the students will be able to - <ul style="list-style-type: none"> • Understand the basic concept of biofertilizers and biopesticides. • Understand the significance and applications of biofertilizers and biopesticides. • Develop skills for the production and application of biofertilizers. • Develop skills for the production and application of biopesticides.
6	Credit Value	02 credits (1C ÷ 1C) Credit=15 hours- Theoretical learning and = 30 hours laboratory or field learning/ training.
7	Total Marks	Max. Marks: 50 Min Passing Marks: 20
Part B: Content of Course (Theory)		
Total No. of Teaching-learning Periods		
Theory- 15 Periods (15 Hrs) and Lab or Field learning/Training 30 periods (30 Hours)		
Module	Topic (Course content)	No. of Period
Theory Contents	Concept of biofertilizers and biopesticides <ol style="list-style-type: none"> 1. Biofertilizers: classification and applications. 2. Symbiotic and asymbiotic process for nitrogen fixation. 3. Methods for production of biofertilizers. 4. Study of VA-mycorrhiza and its application. 5. Biopesticides: classification and applications. 6. Process of production of biopesticides. 7. Importance of <i>Trichoderma</i>, <i>Pseudomonas</i>, and <i>Bacillus</i> species as biocontrol agents. 8. Factors responsible for the effectiveness of bioagents against seed-borne and soil-borne pathogens. 	15
Lab/Field Training Contents	<ol style="list-style-type: none"> 1. Media preparation to culture microorganisms. 2. Collection and isolation of agriculturally important microorganisms. 3. Identification and characterization of microorganisms. 4. Screening of superior strains using in vitro techniques. 5. Inoculum development. 6. Preparation of carrier. 7. Mixing of inoculum and carrier. 8. Efficiency check of developed inoculant by using pot experiments. 	30
Keywords	Biofertilisers, biopesticides, bioagents.	

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• Part C - Learning Resource	
Text Books, Reference Books, Other Resources -	
Text Book- Biofertilisers and biopesticides – K Acharya, S Sen, M Rai	
<ul style="list-style-type: none"> S. Kannaiyan- Biofertiliser Technology-Scientific Publishers. Environmental Biotechnology- Himalaya Publishing House. 	
Reference Book-	
<ul style="list-style-type: none"> Dr. Himadri Panda- The Complete Technology Book on Biofertilizer and Organic Farming- NPCS. 	
Online resources- https://archive.nptel.ac.in/courses/126/105/126105024/	
https://archive.nptel.ac.in/courses/102/105/102105058/	

Part D: Assessment and Evaluation			
Suggested Continuous Evaluation Methods:			
Maximum Marks:		50 Marks	
Continuous Internal Assessment (CIA):		15 Marks	
End Semester Exam (ESE):		35 Marks	
Continuous Internal Assessment (CIA) (By course teacher):	Internal Test / Quiz-(2):	10 +10	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
	Assignment / Seminar + Attendance-	05	
	Total Marks -	15	
End Semester Exam (ESE):	Laboratory/Field Skill Performance: On spot Assessment		Managed by Coordinator as per skilling
	A. Performed the task based on learned skill	- 20 Marks	
	B. Spotting based on tools (written)	- 10 Marks	
	C. Viva-voce (based on principle/technology)	- 05 Marks	

Name and Signature of Convener and Members of CBOS:

Officer-In-Charge (Academic)
 Shaheed Nandkumar Patel
 Vishwavidyalaya, Raigarh (C.G.)

Chairman
 Shaheed Nandkumar Patel
 Vishwavidyalaya, Raigarh (C.G.)

Four Year Undergraduate Program (2024-28)
Department of Biotechnology
Course Curriculum

Part A: Introduction		
Program: BSc in Life Sciences (Certificate/ Diploma/Degree/Honors)		Semester: I Sem
		Session: 2024-2025
1	Course Code	BTVAC-01
2	Course Title	Plants-based Secondary Metabolites
3	Course Type	Value Addition Course (VAC)
4	Pre-requisite (if any)	As per requirement.
5	Course Learning Outcomes (CLO)	After completing this course, the students will be able to - <ul style="list-style-type: none"> Understand the medicinal values applicable to the Indian knowledge system. Identify the plants with medicinal viability. Explore the scientific validation of our traditional knowledge. Develop competency for exploration of secondary metabolites and their application.
6	Credit Value	02 credits (Credit = 15 Hours - learning & observation)
7	Total Marks	Max. Marks: 50 Min Passing Marks: 20
Part B: Content of Course (Theory)		
Total No. of Teaching-learning Periods (01 Hr. per period)- 30 Periods (30 Hours)		
Unit	Topic (Course content)	No. of Period
I	Medicinal plants and their viability <ol style="list-style-type: none"> General account of medicinal plant. Scope of medicinal plants in the Indian market and abroad. Role of medicinal plants in human health, advantage and limitation. The basic theory of instrumental mechanism e.g. Soxhlet, oven, lyophilizer, etc. 	08 (08 Hrs)
II	Significance of the Indian knowledge system <ol style="list-style-type: none"> Extraction techniques used for secondary metabolite isolation. Secondary metabolite storage. Systems of Indian medicines: Ayurveda, Unani, Siddha, and Homeopathy. Classification of crude drugs: Morphological, taxonomical, chemical, and pharmacological. 	07 (07 Hrs)
III	Methods for phytochemical screening <ol style="list-style-type: none"> Preparation technique of herbal infusions, decoctions, lotions, etc. Introduction to phytochemical screening-alkaloids, polyphenolic compounds. Introduction to phytochemical screening- glycosides. Introduction to biological testing of herbal drugs (analgesics, anti-inflammatory and antianxiety agents). 	08 (08 Hrs)
IV	Essential industrial regulations <ol style="list-style-type: none"> Calibration and validation as per ICH and USFDA guidelines. Production management, supply chain management & challenges Government subsidy & industries, 	07 (07 Hrs)

Officer-in-Charge
Shaheed Nandkumar Patel
Amitywavidyalaya, Raigarh (C.G.)

Chairman

Shaheed Nandkumar Patel
Amitywavidyalaya, Raigarh (C.G.)

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	4. Types of diseases by controlled bioagent formulations.	
Keywords	Secondary metabolite, alkaloids, medicinal plants, phytochemicals.	

Part C - Learning Resource	
Text Books, Reference Books, Other Resources -	
Text Book- Plants Secondary Metabolites- AK Sharma	
Plant Secondary Metabolites for Human Health- Dr. M M Abid Ali Khan	
<ul style="list-style-type: none"> Ethnobiology – R.K.Sinha & Shweta Sinha – 2001. Surabhe Publications – Jaipur. Tribal medicine – D.C. Pal & S.K. Jain 1998, Naya Prakash, 206, Bidhan Sarani, Calcutta – 700 006. Contribution to Indian ethnobotany – S.K. Jain 1995, 3rd edition, Scientific publishers, P.B.No. 91, Jodhpur, India. A Manual of Ethnobotany – S.K.Jain, 1995, 2nd edition. 	
Online resources- https://onlinecourses.nptel.ac.in/noc20_bt34/preview http://acl.digimat.in/nptel/courses/video/102106080/lec14.pdf	

Part D: Assessment and Evaluation			
Suggested Continuous Evaluation Methods:			
Maximum Marks:		50 Marks	
Continuous Internal Assessment (CIA):		15 Marks	
End Semester Exam (ESE):		35 Marks	
Continuous Internal Assessment (CIA) (By course teacher):	Internal Test / Quiz-(2):	10 +10	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
	Assignment / Seminar -	05	
	Total Marks -	35	
End Semester Exam (ESE):	Two section – A & B Section A: Q1. Objective – 05 x1= 05 Mark; Q2. Short answer type- 5x2 =10 Marks Section B: Descriptive answer type qts., 1out of 2 from each unit-4x05=20 Marks		

Name and Signature of Convener and Members of CBoS:

Dr. Vijay Kumar Singh
 (Keshav Kant Singh)
 Dr. Shubha Sinha
 Dr. Pramod Malish
 Dr. Anurag Singh
 Dr. Shikha Sharma
 Dr. Armita Panda
 Dr. Sanjay Bheged
 Dr. Neha Bala
 Officer-In-Charge
 Shaheed Nandkumar Patel
 Vishwavidyalaya, Raigarh (C.G.)
 Chairman
 Shaheed Nandkumar Patel
 Vishwavidyalaya, Raigarh (C.G.)

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

COURSE CURRICULUM

PART A: INTRODUCTION		
Program: Certificate Course	Semester- I Sem	Session: 2024-25
1	Course Code	AEC 01
2	Course Title	Environmental Studies
3	Course Type	Ability Enhancement Course (AEC)
4	Prerequisite (If Any)	As per requirement
5	Course Outcome (CO)	At the end of this course, students will be able to – CO 01: relate the basic concept of the environment CO 02: explain environmental alterations CO 03: develop skills in environmental measurement CO 04: examine correction measures of the environment
6	Credit Value	02 C 01 Credit = 15 Hrs. Teaching-Learning
7	Total Marks	Max. Marks: 50 Minimum Pass marks: 20
PART: B CONTENT OF THE COURSE		
Total No. of Teaching-Learning Periods: 30Hours/ 30Periods		No. of Hours
UNIT	TOPIC (Course Contents)	
I	Basic Composition: 1. Abiotic and Biotic components of the environment 2. Biodiversity—Concept, types, and measures about its protection 3. Basic concept of Bio-Geo Chemical Cycle 4. Energy Flow in an ecosystem	07
II	Alterations in Environment: 1. Concept and components of the pond ecosystem 2. Air pollution and measures for its control 3. Water pollution and measures for its control 4. Global warming, Climate change, and possible measures	07
III	Measurements of Environmental Components 1. Soil composition and methods of its analysis 2. Water analysis methods for DO, BOD, COD 3. Water analysis methods for pH, TDS, Turbidity, Salinity, and Alkalinity 4. Information about environmental factors—PM-10, PM-2.5, NO2, O3	08
IV	Application Measures 1. Useful microbes to control water pollution 2. Useful microbes to control soil pollution 3. Concept of Biodegradation 4. Concept of Phytoremediation	08
Key Words	Ecosystem, Pollution, Climate Change, Biodegradation	

Officer-In-Charge (Signature)

Shaheed Nandkumar Patel
Vishwavidyalaya, Raigarh (C.G.)

Name and Signature of Convener and Members of CBOS

Dr. Ujjwalasuge
Dr. Shubha Diwan

Dr. Anurag K. Kumbhar
Dr. Purnod Malush

Dr. Sanjasa Bhagat
11/06/24

Dr. Shivani Shinde
11/6/24

Dr. Neha Behar
11/6/24
Dr. Purnod Malush

Dr. Anurag K. Kumbhar
11/6/24
Dr. Shivani Shinde

PART-C: Learning Resources

Text Books, Reference Books, and Others

Text Books Recommended –

1. Ecology and Environment, 8th Edition, P.D.Sharma, Rastogi Publication, Meerut.
2. Environmental Biology, 2nd Edition, P.D.Sharma, Rastogi Publication, Meerut.
3. Environmental Biology and Toxicology, 2nd Edition, P.D.Sharma, Rastogi Publication, Meerut.
4. Environmental Studies, 1st Edition, S.V.S.Rana, Rastogi Publication, Meerut.
5. Environmental Biotechnology, 1st Edition, S. V. S. Rana, Rastogi Publication, Meerut.

Online Resources–

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

Online Resources–

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

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

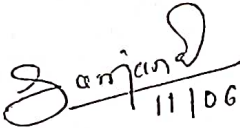
Continuous Internal Assessment (CIA): 15 Marks

End Semester Exam (ESE): 35 Marks

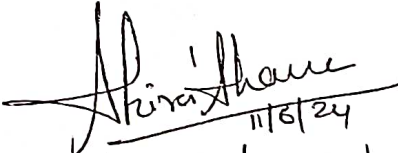
Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2):	10 & 10	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
	Assignment/Seminar +Attendance -	05	
	Total Marks=	15	

End Semester Exam (ESE):	Two sections – A & B
	Section A: Q1. Objective – 05 x1= 05 Mark; Q2. Short answer type- 5x2 =10 Marks
	Section B: Descriptive answer type qts..1out of 2 from each unit- 4x05 =20 Marks

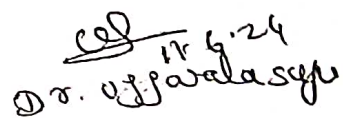
Name and Signature of Convener & Members of CBoS:


11/06/24


(Dr. Sanjani Bhagat)


11/6/24

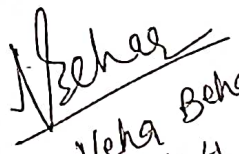
(Dr. Shikha Sharma)


11/6/24

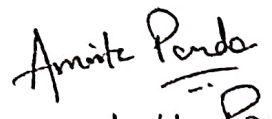
(Dr. Vijayalaxmi)


11/06/24


(Dr. Shubha Diwan)

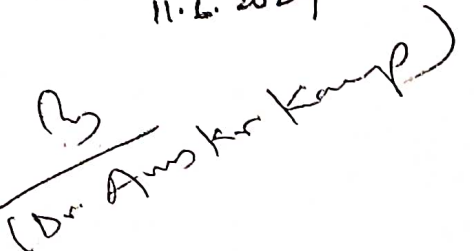

11/6/24

(Dr. Neha Behar)


11.6.2024

(Dr. Amrit Pande)


Dr. Pramod Kumar Mahesh

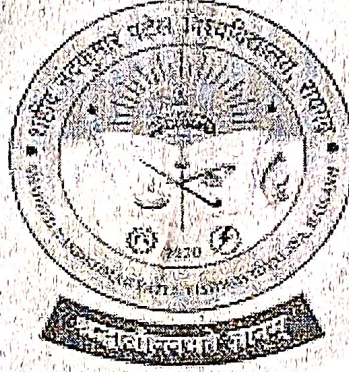

(Dr. Anurag Kaur)

Officer-In-Charge (Academics)
Shaheed Nandkumar Patel
Vishwavidyalaya, Raigarh (C.G.)

Chairman
of Studies
Shaheed Nandkumar Patel
Vishwavidyalaya, Raigarh (C.G.)

शहीद नंदकुमार पटेल विश्वविद्यालय, रायगढ़ (छ.ग.)

(छत्तीसगढ़ विश्वविद्यालय अधिनियम 1973 द्वारा स्थापित राजकीय विश्वविद्यालय)



राष्ट्रीय शिक्षा नीति – 2020
के तहत तृतीय एवं चतुर्थ सेमेस्टर
नवीन पाठ्यक्रम
(सत्र 2025–26)

कायेटिव नोड्स जी॥

FOUR YEAR UNDERGRADUATE PROGRAM (NEP-2020)

Program: Bachelor in Life Sciences (2024 -28)

DISCIPLINE –BIOTECHNOLOGY

Session – 2024 -25

DSC -01 to 08		DSE -01 to 12		DGE -01 & 02	
Code	Title	Code	Title	Code	Title
BTSC -01T	Cell Biology & Biochemistry	BTSE - 01T	Environmental Biotechnology	BTGE -01T	Cell Biology & Biochemistry
BTSC -01P	Lab course	BTSE - 01P	Lab course	BTGE -01P	Lab course
BTSC -02T	Microbiology & Molecular Biology	BTSE - 02T	Bioprocess engineering	BTGE -02T	Microbiology & Molecular Biology
BTSC -02P	Lab course	BTSE - 02P	Lab course	BTGE -02P	Lab course
BTSC -03T	Genetics & Biophysics	BTSE - 03T	Industrial Biotechnology		
BTSC -03P	Lab course	BTSE - 03P	Lab course		
BTSC -04T	Recombinant DNA technology	BTSE - 04T	Medical Biotechnology		
BTSC -04P	Lab course	BTSE - 04P	Lab course		
BTSC -05T	Enzymology	BTSE - 05T	Genomics		
BTSC -05P	Lab course	BTSE - 05P	Lab course	SEC	
BTSC -06T	Immunology	BTSE - 06T	Proteomics	BTSEC-01	Biopesticides & Biofertilizers
BTSC -06P	Lab course	BTSE - 06P	Lab course		
BTSC -07T	Plant & Animal Biotechnology	BTSE - 07T	Agricultural Biotechnology		
BTSC -07P	Lab course	BTSE - 07P	Lab course	VAC	
BTSC -08T	Biostatistics & Bioinformatics	BTSE - 08T	Pharmaceutical Biotechnology	BTVAC-01	Plants-based Secondary Metabolites

Officer-In-Charge (Academic)
Shaheed Nandkumar Patel
Vishwavidyalaya, Raigarh (C.G.)

Chairman
of Studies
Shaheed Nandkumar Patel
Vishwavidyalaya, Raigarh (C.G.)
DR-1 K. K. Paty

BTSC -08P	Lab course	BTSE - 08P	Lab course		
		BTSE - 09T	Microbial Products for Human Consumption		
		BTSE - 09P	Lab course		
		BTSE - 10T	Microbial Products for Agriculture		
		BTSE - 10P	Lab course		
		BTSE - 11T	Microbial Products for Industrial uses		
		BTSE - 11P	Lab course		
		BTSE - 12T	IPR, Biosafety & Bioethics		
		BTSE - 12P	Lab course		

Program Outcomes (PO):

- 1) The student will develop competency to explore natural resources with scientific validation.
- 2) Multifold skills will be developed for their entrepreneurship competency and self-reliance.
- 3) The program will ensure scientific competency, research aptitude, and competency for the promotion of the future of the nation.

Program Specific Outcomes (PSO): (If any)

- 1) The graduates will be competent for sustainable scientific exploration in the field of agriculture, medicine, food and environment.
- 2) The program will integrate traditional and modern knowledge to meet the challenges of the future by the help of genomics, proteomics, bioprocess engineering and biotechnological tools for environmental corrections.

Name and Signature of Convener and Members of CBOS:

Keshav
(Keshav Kant Sahu)

Anita
(Anita Pando)

Shivani Sharma
Dr. Shivani Sharma

Behar
(Dr. Meha Behar)




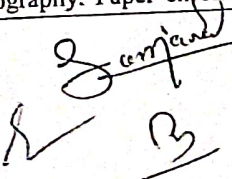
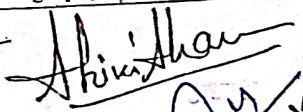
Sanjans
11/11/24
(Dr. Sanjans Bhagel)

Shubha
CD. Shubha
Officer-in-Charge (Academic)
Shaheed Nandkumar Patel
Vishwavidyalaya, Raigarh (C.G.)
Dr. Pramod Malish

Dr. Anshu Kumar
(Dr. Anshu Kumar)

Four Year Undergraduate Program (2024-28)
Department of Biotechnology
Course Curriculum

Part A: Introduction		
Program: Bachelor in Life Sciences (Diploma/Degree/Honors)		Semester: III Sem Session: 2024-2025
1	Course Code	BTSC-03-T
2	Course Title	Genetics and Biophysics
3	Course Type	Discipline Specific Course (DSC)
4	Pre-requisite (if any)	As per program
5	Course Learning Outcomes (CLO)	After completing this course, the students will be able to - <ul style="list-style-type: none"> • Understand classical genetics of inheritance • Understand variation in genes and its impact. • Understand the use of basic physical tools for the measurement of biological processes.
6	Credit Value	03 Credits (Credit = 15 Hours - learning & observation)
7	Total Marks	Max. Marks: 100 Min Passing Marks: 40
Part B: Content of Course (Theory)		
Total No. of Teaching-learning Periods (01 Hr. per period)- 45 Periods (45 Hours)		
Unit	Topic (Course content)	No. of Period
I	Chromosome and gene <ol style="list-style-type: none"> 1. Techniques to study chromosomes: Karyotyping, banding, chromosome labeling, comparative genome hybridization. 2. Change in chromosome number & structure: Ploidy and rearrangement (Deletion, Duplication, Inversion & Translocation). 3. Concept of gene: Fine structure of gene, split gene, pseudogenes, non-coding genes, overlapping genes & multigene family. 4. Mutation: Classification, mechanism, repair, role in evolution. 	12 (12 Hrs)
II	Classical genetics <ol style="list-style-type: none"> 1. Mendelian genetics- basic principles and interaction of genes. 2. Linkage, Crossing Over. 3. Sex-linked inheritance and pedigree. 4. Cytoplasmic inheritance. 	11 (11 Hrs)
III	Instrumentation I <ol style="list-style-type: none"> 1. Simple microscopy, phase contrast microscopy, fluorescence, and electron microscopy (TEM and SEM). 2. pH meter, absorption, and emission spectroscopy 3. Principle and law of absorption fluorimetry, colorimetry, spectrophotometry (visible, UV, infra-red), 4. Centrifugation principle and its types. 	11 (11 Hrs)
IV	Instrumentation II <ol style="list-style-type: none"> 1. Introduction to electrophoresis. Starch-gel, agarose-gel electrophoresis, immuno-electrophoresis. 2. Introduction to the principle of chromatography. Paper chromatography, 	11 (11 Hrs)

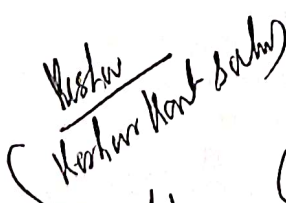
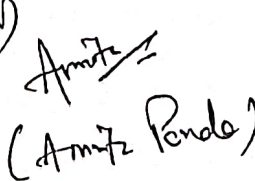
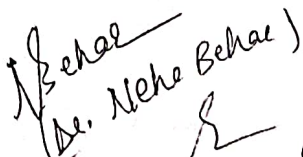
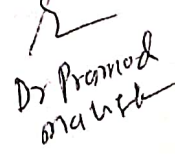
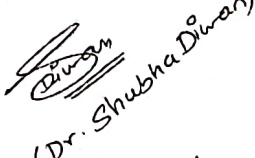
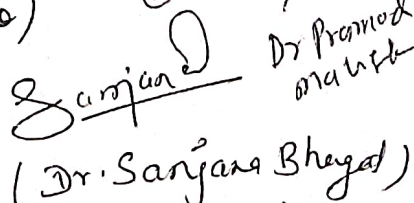
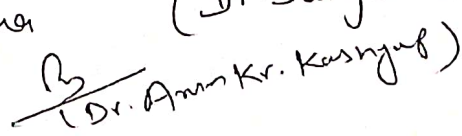
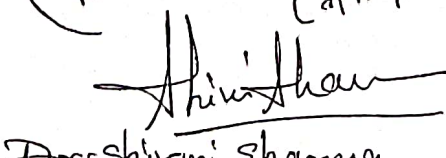
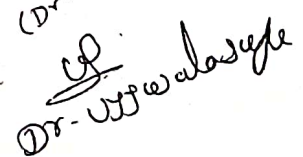

ध्यान मंडल
 शहीद चंद प्रयाग
 2023

	thin layer chromatography, column chromatography: silica and gel filtration, affinity and ion exchange chromatography, gas chromatography, HPLC.	
	3. Introduction to Biosensors and their applications.	
	4. Radioisotopes in Biology. Autoradiography, DNA fingerprinting.	
Keywords	Gene, Genetic alteration, Spectrophotometry, Electrophoresis.	

• Part C - Learning Resource	
Text Books, Reference Books, Other Resources -	
Text Book-	
➤ Genetics- PS Verma	
➤ Genetics- BD Singh	
➤ Genetics- Veer Bala Rastogi	
• Gardner, E.J., Simmons, M.J., Snustad, D.P. (2006). Principles of Genetics. VIII Edition John Wiley & Sons.	
• Snustad, D.P., Simmons, M.J. (2009). Principles of Genetics. V Edition. John Wiley and Sons Inc.	
• Klug, W.S., Cummings, M.R., Spencer, C.A. (2009). Concepts of Genetics. IX Edition. Benjamin Cummings.	
• Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley & Sons. Inc.	
• De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.	
• Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.	
Online resources- https://archive.nptel.ac.in/courses/102/104/102104052/ https://onlinecourses.swayam2.ac.in/ccc21_bt05/preview	

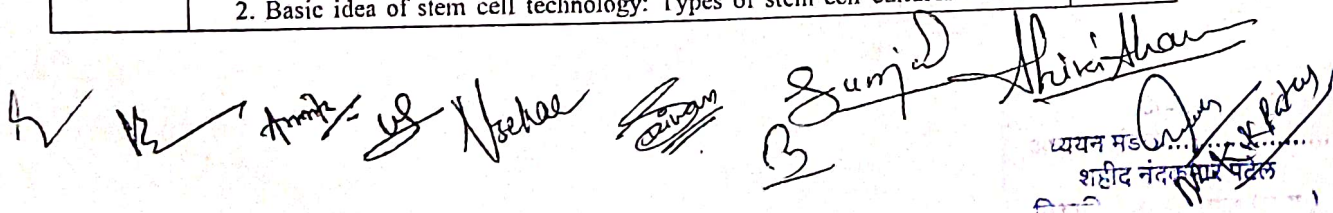
Part D: Assessment and Evaluation			
Suggested Continuous Evaluation Methods:			
Maximum Marks:		100 Marks	
Continuous Internal Assessment (CIA):		30 Marks	
End Semester Exam (ESE):		70 Marks	
Continuous Internal Assessment (CIA) (By course teacher):	Internal Test / Quiz-(2):	20 +20	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment / Seminar -	10	
	Total Marks -	30	
End Semester Exam (ESE):	Two section – A & B Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 =20 Marks Section B: Descriptive answer type qts., 1out of 2 from each unit-4x10=40 Marks		

Name and Signature of Convener and Members of CBoS:


 (Keshav Kant Sahni)

 (Anurag Pande)

 (Dr. Neha Behar)

 Dr. Pramod

 (Dr. Shubha Divan)

 (Dr. Sanjana Bhegal)

 (Dr. Anurag K. Kashyap)

 Dr. Shivani Sharma

 Dr. V. V. Walase

 (Dr. Anurag K. Kashyap)
 ध्यान मंडल
 शहीद नंदलाल मंडल
 लि-1

Four Year Undergraduate Program (2024-28)
Department of Biotechnology
Course Curriculum

Part A: Introduction			
Program: Bachelor in Life Sciences (Diploma/Degree/Honors)		Semester: IV Sem	Session: 2024-2025
1	Course Code	BTSC-04-T	
2	Course Title	Recombinant DNA technology	
3	Course Type	Discipline Specific Course (DSC)	
4	Pre-requisite (if any)	As per program	
6	Course Learning Outcomes (CLO)	After completing this course, the students will be able to - <ul style="list-style-type: none"> • Understand various tools of genetic engineering. • Develop competency in genetic exploitation for human welfare. • Understand the practical application of recombinant DNA technology. • Understand the use of information technology in the field of genome and proteome analysis. 	
6	Credit Value	03 Credits (Credit = 15 Hours - learning & observation)	
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40
Part B: Content of Course (Theory)			
Total No. of Teaching-learning Periods (01 Hr. per period)- 45 Periods (45 Hours)			
Unit	Topic (Course content)	No. of Period	
I	Prerequisites of rDNA technology <ol style="list-style-type: none"> 1. Recombinant DNA technology: General concept. Steps and application. 2. Host controlled Restriction Modification System, Ligases and Polymerases, Klenow fragment, Taq, Pfu polymerase. 3. Nuclease (Endo, Exo, and restriction endonuclease). 4. Modification Enzyme (Kinase, Phosphates and terminal deoxynucleotidyltransferase), Reverse Transcriptase. 	12 (12 Hrs)	
II	Gene transfer <ol style="list-style-type: none"> 1. Vectors: Based on Plasmid, Bacteriophages, Cosmid. 2. High capacity vectors. 3. The basic concept of Gene Transfer Methods: Microinjection, Electroporation, Lipofection, and Microprojectile. 4. Selection and Screening of Recombinants: Genetic and Hybridization methods. 	11 (11 Hrs)	
III	Genomic validation <ol style="list-style-type: none"> 1. PCR: Types of PCR, Steps, Applications, Advantages and Limitations of PCR. 2. Molecular Marker-RFLP, RAPD, and Microarray. 3. Human Genome Project. 4. Gene Library: Genomic and cDNA library, Chromosome walking and jumping. 	11 (11 Hrs)	
IV	Application of genetic technology <ol style="list-style-type: none"> 1. Gene Therapy: <i>In vivo</i> and <i>Ex vivo</i>, germline and somatic gene therapy. 2. Basic idea of stem cell technology: Types of stem cell cultures and their 	11 (11 Hrs)	



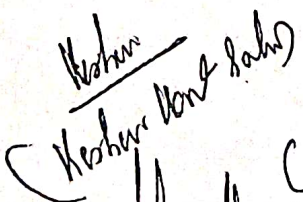
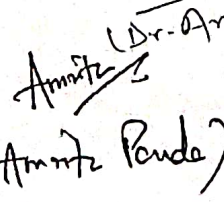
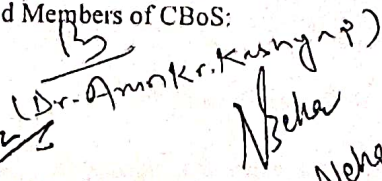
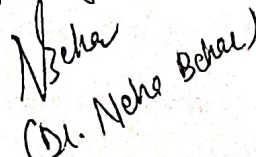
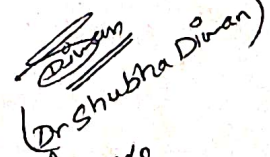
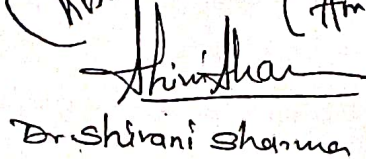
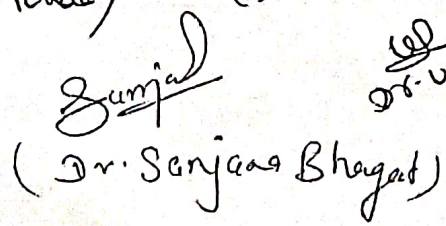
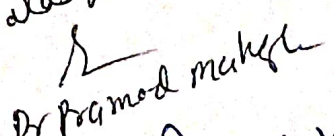
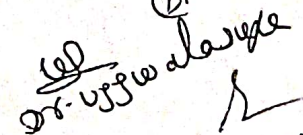
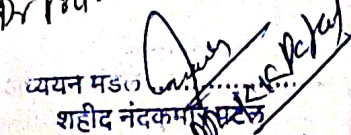
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	Significance. 3. Introduction to Genomics, DNA sequencing methods – manual & automated: Maxam & Gilbert and Sangers method. 4. Introduction to protein structure, Chemical properties of proteins, physical interactions that determine the property of proteins, short-range interactions, electrostatic forces, van der Waal interactions, hydrogen bonds, and Hydrophobic interactions.	
Keywords	Recombinant DNA, Vectors, PCR, cDNA library.	

• Part C - Learning Resource	
Text Books, Reference Books, Other Resources -	
Text Book-	
➤ P S Verma and A K Agrawal	
➤ An introduction to genetic engineering- S T Tischoll	
• Molecular Biology; Watson.	
• Gene VIII; Benjamin Lewin.	
• The Cell, A molecular Approach; Geoffrey M. Cooper.	
• Molecular Biology of the Cell; Alberts	
• Modern Biotechnology, 2nd Edition, S.B. Primrose, Blackwell Publishing, 1987.	
• Molecular Biotechnology: Principles and Applications of Recombinant DNA, 4th Edition, B.R. Glick, J.J. Pasternak and C.L. Patten, 2010.	
• Molecular Cloning: A Laboratory Manual (3rd Edition) Sambrook and Russell Vol. I to III, 1989.	
• Principles of Gene Manipulation 6th Edition, S.B.Primrose, R.M.Twyman and R.W. Old. Blackwell Science, 2001.	
• Online resources- https://onlinecourses.swayam2.ac.in/cec21_bt05/preview	
• https://archive.nptel.ac.in/courses/102/104/102104052/	
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Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks:	100 Marks	
Continuous Internal Assessment (CIA):	30 Marks	
End Semester Exam (ESE):	70 Marks	
Continuous Internal Assessment (CIA) (By course teacher):	Internal Test / Quiz-(2): 20 +20 Assignment / Seminar - 10 Total Marks - 30	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
End Semester Exam (ESE):	Two section – A & B Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 =20 Marks Section B: Descriptive answer type qts., 1 out of 2 from each unit- 4x10=40 Marks	

Name and Signature of Convener and Members of CBoS:


 (Keshur Kung Sahu)

 (Ananta Bende)

 (Dr. Anurag K. Kushnarp)

 (Dr. Neha Behal)

 (Dr. Shubha Divan)

 Dr. Shivani Sharma

 (Dr. Sanjasa Bhagat)

 Dr. Pragmod Mahesh

 Dr. Pooja Dhar

 Dr. Shashi Nandkumar
 व्ययन मंड (Dr. Pooja Dhar)
 शहीद नंदकमर

Four Year Undergraduate Program (2024-28)
Department of Biotechnology
Course Curriculum

Part A: Introduction		
Program: Bachelor in Life Sciences (Diploma/Degree/Honors)		Semester: III Sem Session: 2024-2025
1	Course Code	BTSC-03-P
2	Course Title	Genetics and Biophysics
3	Course Type	Discipline Specific Course (DSC) - Practical
4	Pre-requisite (if any)	As per program
5	Course Learning Outcomes (CLO)	After completing this course, the students will be able to - <ul style="list-style-type: none"> • Perform cellular replication. • To conduct genetic inheritance and interpretation. • Nucleic acid estimation. • Perform biological extraction, identification and measurement.
6	Credit Value	01 Credits Credit = 30 Hours Laboratory or Field learning/Training
7	Total Marks	Max. Marks: 50 Min Passing Marks: 20
Part B: Content of Course		
Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)		
Module	Topic (Course content)	No. of Period
Lab./Field Training/ Experiment Contents of Course	<ol style="list-style-type: none"> 1. Permanent and temporary mount of mitosis and meiosis. 2. Karyotyping with the help of photographs. 3. Problems regarding Genetics and Mendelian deviations in dihybrid crosses. 4. Pedigree charts of some common characteristics like blood group, color blindness, and PTC tasting. 5. Temporary mount of Giant chromosome. 6. Photometric (colorimetric/spectrophotometric) estimation of nucleic acid. 7. Cellular fractionation by centrifugation. 8. Maintenance and operation of laminar airflow. 9. Extraction by using the Soxhlet method. 10. To identify lipids in a given sample by TLC. 11. To verify the validity of Beer's law and determine the molar extinction coefficient of NADH. 12. Operation of electrophoresis for protein. 	30
Keywords	Gene, Genetic alteration, Spectrophotometry, Electrophoresis.	

• Part C - Learning Resource	
Text Books, Reference Books, Other Resources -	
Text Book-	

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 CS B, Ananta

Handwritten signature:
 Dr. Neha

Handwritten signature:
 Samir

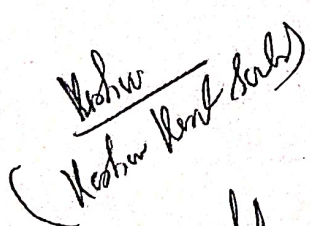
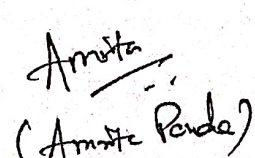
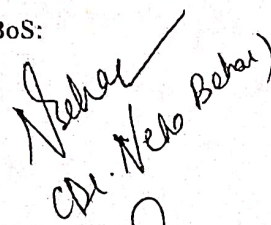
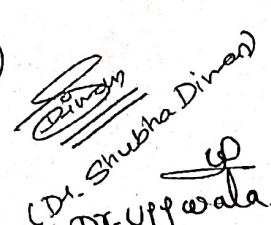
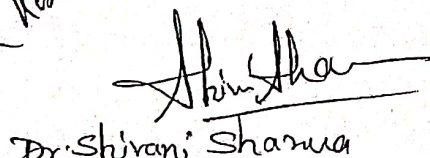
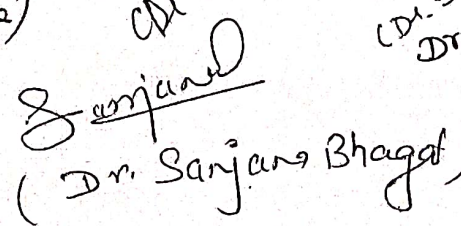
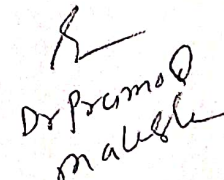
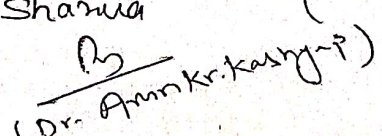
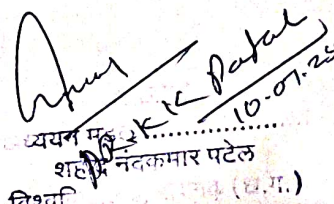
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<ul style="list-style-type: none"> ➤ Genetics- PS Verma ➤ Genetics- BD Singh ➤ Genetics- Veer Bala Rastogi
<ul style="list-style-type: none"> • Gardner, E.J., Simmons, M.J., Snustad, D.P. (2006). Principles of Genetics. VIII Edition John Wiley & Sons. • Snustad, D.P., Simmons, M.J. (2009). Principles of Genetics. V Edition. John Wiley and Sons Inc. • Klug, W.S., Cummings, M.R., Spencer, C.A. (2009). Concepts of Genetics. IX Edition. Benjamin Cummings. • Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley & Sons. Inc. • De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia. • Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
Online resources- https://archive.nptel.ac.in/courses/102/104/102104052/ https://onlinecourses.swayam2.ac.in/cec21_bt05/preview

Part D: Assessment and Evaluation			
Suggested Continuous Evaluation Methods:			
Maximum Marks:	50 Marks		
Continuous Internal Assessment (CIA):	15 Marks		
End Semester Exam (ESE):	35 Marks		
Continuous Internal Assessment (CIA) (By course teacher):	Internal Test / Quiz-(2): 10 +10 Assignment / Seminar + Attendance- 05 Total Marks - 15	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks	
End Semester Exam (ESE):	Laboratory / Field Skill Performance: A. On spot Assessment - 20 Marks B. Spotting based on tools & technology (written) – 10 Marks C. Viva-voce (based on principle/technology) - 05 Marks	Managed by course teacher as per lab status	

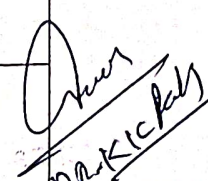
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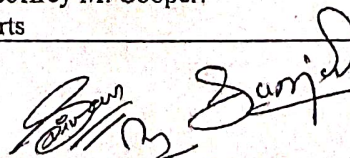
 (Keshav Keshav Singh)
 Ananta
 Dr. Neel Behar
 Dr. Shubha Dinesh
 Dr. Shivani Sharma
 Dr. Sanjans Bhagat
 Dr. Pramod Mahesh
 Dr. Anurag K. Kashyap
 Dr. K. K. Patel
 10-07-25
 शहद नंदकमार पटेल
 विश्वविद्यालय (C.B.S.)

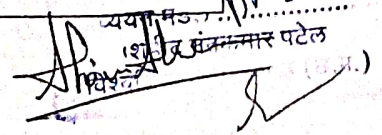
Four Year Undergraduate Program (2024-28)
Department of Biotechnology
Course Curriculum

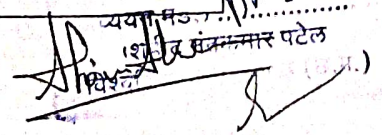
Part A: Introduction		
Program: Bachelor in Life Sciences (Diploma/Degree/Honors)		Semester: IV Sem Session: 2024-2025
1	Course Code	BTSC-04-P
2	Course Title	Recombinant DNA technology
3	Course Type	Discipline Specific Course (DSC) - Practical
4	Pre-requisite (if any)	As per program
6	Course Learning Outcomes (CLO)	After completing this course, the students will be able to - <ul style="list-style-type: none"> Isolate nucleic acid from biological cells. Estimate and manipulate nucleic acid. Amplify nucleic acid. Analyse nucleic acid on the basis of database.
6	Credit Value	01 Credits Credit = 30 Hours Laboratory or Field learning/Training
7	Total Marks	Max. Marks: 50 Min Passing Marks: 20
Part B: Content of Course		
Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)		
Module	Topic (Course content)	No. of Period
Lab./Field Training/ Experiment Contents of Course	<ol style="list-style-type: none"> Isolation of chromosomal DNA from plant cells Isolation of chromosomal DNA from <i>E.coli</i> Qualitative and quantitative analysis of DNA using spectrophotometer Plasmid DNA isolation Restriction digestion of DNA. Ligation of DNA. Transformation of competent cells. Demonstration of PCR. Use of SNP databases at NCBI and other sites. Use of OMIM database Detection of Open Reading Frames using ORF Finder 	30
Keywords	Recombinant DNA, Vectors, PCR, cDNA library.	

Part C - Learning Resource	
Text Books, Reference Books, Other Resources -	
Text Book-	
<ul style="list-style-type: none"> P S Verma and A K Agrawal An introduction to genetic engineering- S T Tischoll 	
<ul style="list-style-type: none"> Molecular Biology; Watson. Gene VIII; Benjamin Lewin. The Cell, A molecular Approach; Geoffrey M. Cooper. Molecular Biology of the Cell; Alberts 	


 Anur


 Sanjay

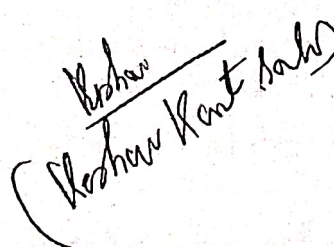
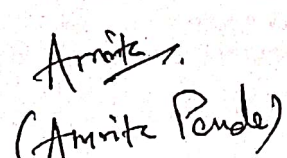
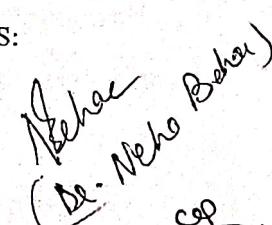
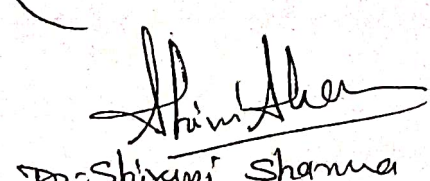
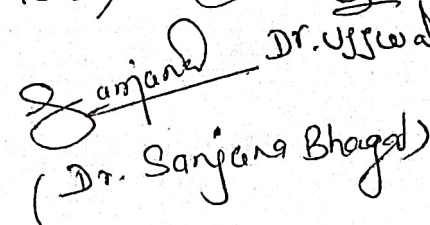
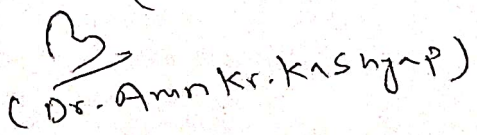
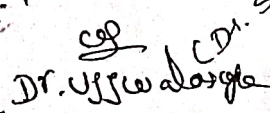
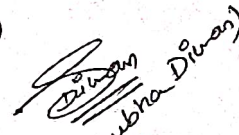
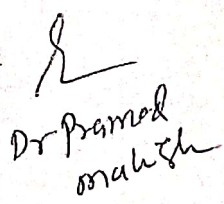

 Dr. Pankaj



 Dr. Anur

- Modern Biotechnology, 2nd Edition, S.B. Primrose, Blackwell Publishing, 1987.
- Molecular Biotechnology: Principles and Applications of Recombinant DNA, 4th Edition, B.R. Glick, J.J. Pasternak and C.L. Patten, 2010.
- Molecular Cloning: A Laboratory Manual (3rd Edition) Sambrook and Russell Vol. I to III, 1989.
- Principles of Gene Manipulation 6th Edition, S.B. Primrose, R.M. Twyman and R.W. Old. Blackwell Science, 2001.
- Online resources- https://onlinecourses.swayam2.ac.in/cec21_bt05/preview
- <https://archive.nptel.ac.in/courses/102/104/102104052/>

Part D: Assessment and Evaluation			
Suggested Continuous Evaluation Methods:			
Maximum Marks:		50 Marks	
Continuous Internal Assessment (CIA):		15 Marks	
End Semester Exam (ESE):		35 Marks	
Continuous Internal Assessment (CIA) (By course teacher):	Internal Test / Quiz-(2):	10 +10	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
	Assignment / Seminar + Attendance-	05	
	Total Marks -	15	
End Semester Exam (ESE):	Laboratory / Field Skill Performance:		Managed by course teacher as per lab status
	A. On spot Assessment -	20 Marks	
	B. Spotting based on tools & technology (written) -	10 Marks	
	C. Viva-voce (based on principle/technology) -	05 Marks	

Name and Signature of Convener and Members of CBoS:

 (Keshav Kant Sahu)
 (Anurag)
 (Dr. Neha Bhat)
 (Dr. Shikha Sharma)
 (Dr. Sanjana Bhargava)
 (Dr. Anurag K. Kashyap)
 (Dr. Ujjwal Singh)
 (Dr. Shubha Divan)
 (Dr. Prasad Mahesh)


 प्रमुख
 शहीद नंद
 विभाग

Four Year Undergraduate Program (2024-28)
Department of Biotechnology
Course Curriculum




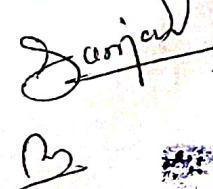
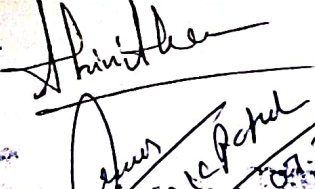

Part A: Introduction			
Program: Bachelor in Life Sciences (Diploma/Degree/Honors)		Semester: III Sem	Session: 2024-2025
1	Course Code	BTSE-01-T	
2	Course Title	Environmental Biotechnology	
3	Course Type	Discipline Specific Elective course (DSE)	
4	Pre-requisite (if any)	As per program	
5	Course Learning Outcomes (CLO)	After completing this course, the students will be able to - <ul style="list-style-type: none"> • Understand wastewater management. • Understand the significance and scope of biodegradation. • Develop skills for bioremediation. • Develop skills for the management of xenobiotics. 	
6	Credit Value	03 Credits (Credit = 15 Hours - learning & observation)	
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40

Part B: Content of Course (Theory)

Total No. of Teaching-learning Periods (01 Hr. per period)- 45 Periods (45 Hours)

Unit	Topic (Course content)	No. of Period
I	Environmental treatments <ol style="list-style-type: none"> 1. Domestic (municipal) and industrial wastewater treatments: primary, secondary and tertiary. 2. Important microorganisms in wastewater treatment, principles of their growth and plasmid-borne metabolic activities. 3. Aerobic biological treatments: activated sludge process rotating biological contactors. 4. Anaerobic biological treatments: airlift membrane bioreactors packed bed (column reactor.) 	12 (12 Hrs)
II	Environmental degradation <ol style="list-style-type: none"> 1. Biodegradation: definition and concept, ready biodegradation, ultimate biodegradation and inherent biodegradation. 2. Aerobic and anaerobic degradation pathways in microbes. 3. Biodegradation of hydrocarbon with suitable example. 4. Concept of municipal solid waste management. 	11 (11 hrs)
III	Environmental remediation <ol style="list-style-type: none"> 1. Introduction, definition and concept, methods of bioremediation (in situ and ex-situ methods) 2. Bioremediation of soil (saline soil and alkaline soil) 3. Phytoremediation: concept and types. 4. Applications of bioremediation. 	11 (11 hrs)

4. Applications of bioremediation.





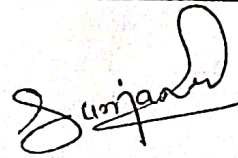
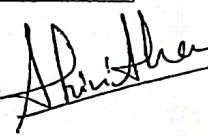
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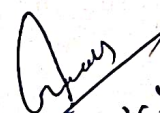
IV	Environmental contamination <ol style="list-style-type: none"> 1. Xenobiotics and recalcitrancy. 2. Xenobiotics degradation: pesticide degradation, herbicide degradation 3. Metabolism of xenobiotics. 4. Cytochrome p450 system, phase I, phase II, metabolic reactions. 	11 (11 hrs)
Keywords	Wastewater management, biodegradation, bioremediation, xenobiotics.	

• Part C - Learning Resource	
Text Books, Reference Books, Other Resources -	
Text Book-	
<ul style="list-style-type: none"> • Murugesan A. G. and Rajakumari C-Environmental Science and Biotechnology: Theory & Techniques, MJP • Asthana D.K. and Asthana M.,-Environment: Problems and Solutions- S. Chand • Chatterji A.K., Introduction to Environmental Biotechnology, Prentice Hall of India Pvt. Ltd 	
Reference Book-	
<ul style="list-style-type: none"> • Jogdand S.N.- Environmental Biotechnology- Himalaya Publishing House • Kalaichelvan P.T., I Arul Pandi- Bioprocess Technology, MJP Publishers • Rajendran, Gunashekar- Microbial Bioremediation-MJP • Hammer & Hammer-Water & Wastewater Technology-PHI • Metcalf & Eddy-Waste water Engineering-TMH • Indushekar Thakur- Environmental Biotechnology-I K International 	
Online resources- https://onlinecourses.nptel.ac.in/noc21_bt41/preview http://acl.digimat.in/nptel/courses/video/102105088/102105088.html	

Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks:	100 Marks	
Continuous Internal Assessment (CIA):	30 Marks	
End Semester Exam (ESE):	70 Marks	
Continuous Internal Assessment (CIA) (By course teacher):	Internal Test / Quiz-(2): 20 +20 Assignment / Seminar - 10 Total Marks - 30	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
End Semester Exam (ESE):	Two section – A & B Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 =20 Marks Section B: Descriptive answer type qts., 1 out of 2 from each unit-4x10=40 Marks	

Name and Signature of Convener and Members of CBoS:

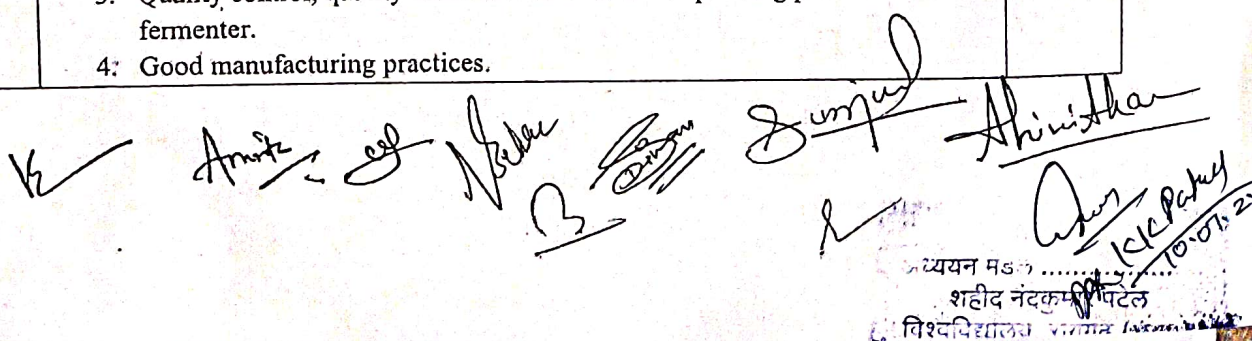








 DR. K.K. Patel
 10.07.2025
 अध्यक्ष मंडळ
 शहीद नंदकुमार पटेल
 विश्वविद्यालय, रायगड (उ.ग.)

Four Year Undergraduate Program (2024-28)
Department of Biotechnology
Course Curriculum

Part A: Introduction		
Program: Bachelor in Life Sciences (Degree/Honors)		Semester: IV Sem
		Session: 2024-2025
1	Course Code	BTSE-02-T
2	Course Title	Bioprocess Engineering
3	Course Type	Discipline Specific Elective course (DSE)
4	Pre-requisite (if any)	As per program
5	Course Learning Outcomes (CLO)	After completing this course, the students will be able to - <ul style="list-style-type: none"> Understand the prerequisite of bioprocess engineering. Develop skills for the operation of bioreactors. Develop skills for industrial production. Understand the geological exploitation by the process of bioprocess engineering.
6	Credit Value	03 Credits (Credit = 15 Hours - learning & observation)
7	Total Marks	Max. Marks: 100 Min Passing Marks: 40

Part B: Content of Course (Theory)		
Total No. of Teaching-learning Periods (01 Hr. per period)- 45 Periods (45 Hours)		
Unit	Topic (Course content)	No. of Period
I	Concept of bioprocess engineering <ol style="list-style-type: none"> Introduction to bioprocess engineering. Isolation, preservation, and maintenance of industrial microorganisms. Media for industrial fermentation. Kinetics of microbial fermentation. 	12 (12 Hrs)
II	Bioreactors <ol style="list-style-type: none"> Types of fermentation processes. Operations of bioreactors. Measurement and control of bioprocess parameters. Downstream processing. 	11 (11 hrs)
III	Bioproducts <ol style="list-style-type: none"> Production of alcohol, acids and solvents. Production of antibiotics. Production of amino acids. Whole cell immobilization for industrial application. 	11 (11 hrs)
IV	Microbial role and regulation <ol style="list-style-type: none"> Application of microbes in mineral beneficiation. Application of microbes for oil recovery. Quality control, quality assurance and standard operating procedures of fermenter. Good manufacturing practices. 	11 (11 hrs)





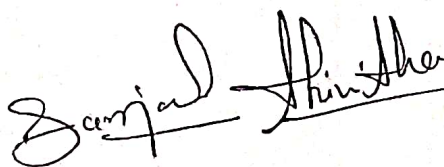

 अध्यापक
 शहीद नंदकुमार पटेल
 विश्वविद्यालय


Keywords	Fermentation, bioreactors, fermentation-based production, mineral beneficiation.
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• Part C - Learning Resource	
Text Books, Reference Books, Other Resources -	
Text book- Industrial Biotechnology- D Das	
• Industrial Microbiology- A.H. Patel.	
Reference Book-	
• Wastewater Engineering- Treatment, Disposal & Reuse. Metall and Eddy, Inc., Tata McGraw Hill, N. Delhi.	
• Microbiology- Pelczar&Pelczar.	
• Environmental Biotechnology, PrathamVashishith. Dominant Publishers And Distributors, N.Delhi.	
• Principles of Fermentation Technology; Stanburry.	
• Industrial Microbiology; Casida.	
Online resources- https://archive.nptel.ac.in/courses/102/105/102105058/	
http://www.ndl.gov.in/he_document/nptel/downloads_new_lecturenotes_102105058_102105058	

Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks:	100 Marks	
Continuous Internal Assessment (CIA):	30 Marks	
End Semester Exam (ESE):	70 Marks	
Continuous Internal Assessment (CIA) (By course teacher):	Internal Test / Quiz-(2):	20 +20
	Assignment / Seminar -	10
	Total Marks -	30
	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks	
End Semester Exam (ESE):	Two section – A & B Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 =20 Marks Section B: Descriptive answer type qts., 1out of 2 from each unit-4x10=40 Marks	

Name and Signature of Convener and Members of CBoS:

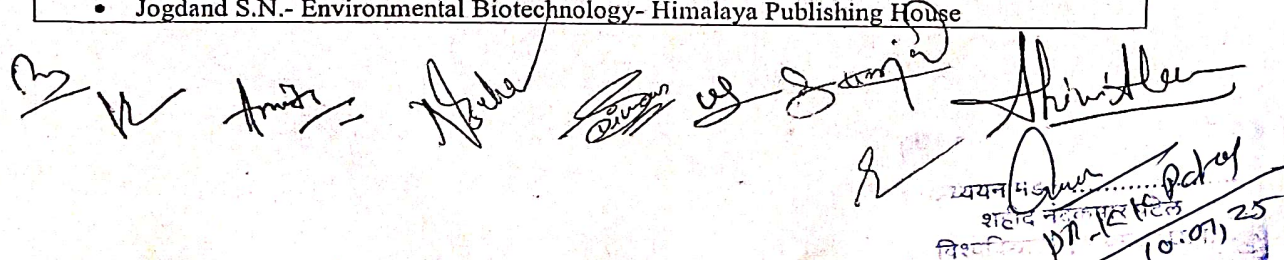







 V. K. Singh
 07.07.2025
 अध्यक्ष मंडल
 शहीद नंदलाल पटेल
 विश्वविद्यालय, रायचूर (उ.प्र.)

Four Year Undergraduate Program (2024-28)
Department of Biotechnology
Course Curriculum

Part A: Introduction		
Program: Bachelor in Life Sciences (Diploma/Degree/Honors)		Semester: III Sem Session: 2024-2025
1	Course Code	BTSE-01-P
2	Course Title	Environmental Biotechnology
3	Course Type	Discipline-Specific Elective (DSE)--Practical
4	Pre-requisite (if any)	As per program
5	Course Learning Outcomes (CLO)	After completing this course, the students will be able to - <ul style="list-style-type: none"> • Understand and analyze physical and chemical parameters of the water bodies. • Estimate biological pollutants from the water bodies. • Determine physical and nutritional conditions of the soil. • Estimate various inorganic and organic contents from pollutants.
6	Credit Value	01 Credits Credit = 30 Hours Laboratory or Field learning/Training
7	Total Marks	Max. Marks: 50 Min Passing Marks: 20
Part B: Content of Course (Theory)		
Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)		
Module	Topic (Course content)	No. of Period
Lab./Field Training/ Experiment Contents of Course	<ol style="list-style-type: none"> 1. Determination of DO, and BOD, from polluted water sample. 2. Determination of COD from a polluted water sample. 3. Bacterial examination of water by MPN test. 4. Coliform test. 5. Determination of soil pH and total organic carbon. 6. NPK determination from soil. 7. Determination of alkalinity and hardness of water. 8. Estimation of total nitrogen in Kjeldahl's method. 	30
Keywords	Wastewater management, biodegradation, bioremediation, xenobiotics.	



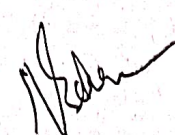

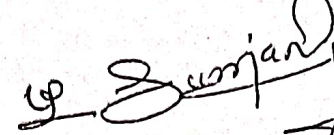
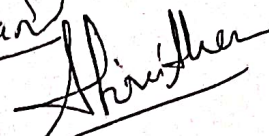
• Part C - Learning Resource	
Text Books, Reference Books, Other Resources -	
Text Book-	
<ul style="list-style-type: none"> • Murugesan A, G. and Rajakumari C-Environmental Science and Biotechnology: Theory & Techniques, MJP • Asthana D.K. and Asthana M.,-Environment: Problems and Solutions- S. Chand • Chatterji A.K., Introduction to Environmental Biotechnology, Prentice Hall of India Pvt. Ltd 	
Reference Book-	
<ul style="list-style-type: none"> • Jogdand S.N.- Environmental Biotechnology- Himalaya Publishing House 	

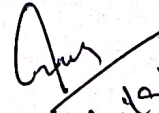

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<ul style="list-style-type: none"> • Kalaiichelvan P.T., I Arul Pandi- Bioprocess Technology, MJP Publishers • Rajendran, Gunashekaran- Microbial Bioremediation-MJP • Hammer & Hammer-Water & Wastewater Technology-PHI • Metcalf & Eddy-Waste water Engineering-TMH • Indushekhar Thakur- Environmental Biotechnology-I K Internation
Online resources- https://onlinecourses.nptel.ac.in/noc21_bt41/preview http://aet.digitat.in/nptel/courses/video/102105088/102105088.html

Part D: Assessment and Evaluation			
Suggested Continuous Evaluation Methods:			
Maximum Marks:		50 Marks	
Continuous Internal Assessment (CIA):		15 Marks	
End Semester Exam (ESE):		35 Marks	
Continuous Internal Assessment (CIA) (By course teacher):	Internal Test / Quiz-(2):	10 +10	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
	Assignment / Seminar + Attendance-	05	
	Total Marks -	15	
End Semester Exam (ESE):	Laboratory / Field Skill Performance:		Managed by course teacher as per lab status
	A. On spot Assessment - 20		
	B. Spotting based on tools & technology (written) – 10 Marks		
	C. Viva-voce (based on principle/technology) - 05 Marks		

Name and Signature of Convener and Members of CBoS:

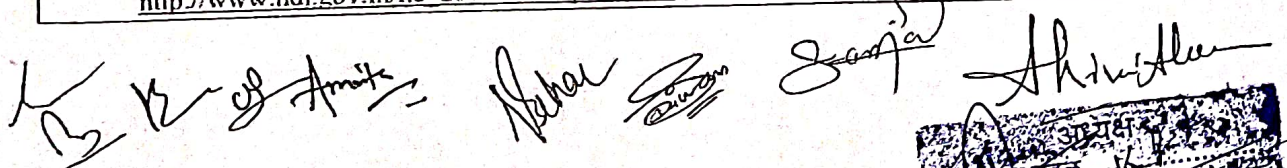
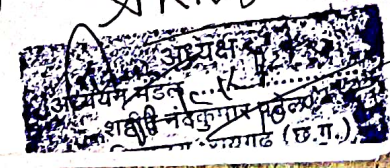








 Date: 10.07.25
 शहीद नरकमर पटेल
 विभाग, (U.N.)

Four Year Undergraduate Program (2024-28)
Department of Biotechnology
Course Curriculum

Part A: Introduction		
Program: Bachelor in Life Sciences (Diploma/Degree/Honors)		Semester: IV Sem Session: 2024-2025
1	Course Code	BTSE-02-P
2	Course Title	Bioprocess Engineering
3	Course Type	Discipline-Specific Elective (DSE)--Practical
4	Pre-requisite (if any)	As per program
5	Course Learning Outcomes (CLO)	After completing this practical course, the students will be able to - <ul style="list-style-type: none"> Isolate and maintain industrially significant microbes. Develop skills for alcoholic production. Develop skills for acid production. Develop skills for antibiotic and enzyme production.
6	Credit Value	01 Credits Credit = 30 Hours Laboratory or Field learning/Training
7	Total Marks	Max. Marks: 50 Min Passing Marks: 20
Part B: Content of Course (Theory)		
Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)		
Module	Topic (Course content)	No. of Period
Lab./Field Training/ Experiment Contents of Course	<ol style="list-style-type: none"> Isolation of industrially important microorganisms for microbial process. Determination of thermal death point (TDP) and thermal death time (TDT) of microorganisms. Comparative studies of ethanol production using different substrates. Microbial production of citric acid using <i>Aspergillus niger</i>. Microbial production of antibiotics (<i>Penicillin</i>) Production and estimation of alkaline protease. 	30
Keywords	Fermentation, bioreactors, fermentation-based production, mineral beneficiation.	

• Part C - Learning Resource	
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<ul style="list-style-type: none"> Industrial Microbiology- A.H. Patel. 	
Reference Book-	
<ul style="list-style-type: none"> Wastewater Engineering- Treatment, Disposal & Reuse. Metall and Eddy, Inc., Tata Mcgraw Hill, N. Delhi. Microbiology- Pelczar & Pelczar. Environmental Biotechnology, Pratham Vashishith. Dominant Publishers And Distributors, N. Delhi. Principles of Fermentation Technology; Stanbury. Industrial Microbiology; Casida. 	
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	C. Viva-voce (based on principle/technology) - 05 Marks	
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Name and Signature of Convener and Members of CBoS:

