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

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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.

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Name and Signature of Convener and Members of CBoS:

(Keshav Kant Sahu)

(Amrita Pando)

Dr. Shikha Sharma

(Dr. Neha Behar)

Sanjaan 11/6/24

(Dr. Sanjaan Bhagat)

Dr. Shubha Tiwari

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Dr Pramod Malviya

(Dr. Amrita Kar)

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 – • 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** 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** 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** 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** 1. Enzymes- Nomenclature and classification, mechanism of action, and factors affecting enzyme action. 2. Carbohydrate metabolism- Glycolysis, Kreb cycle, gluconeogenesis, glycogenesis. 3. Lipid metabolism- Beta oxidation of fatty acids, fatty acid biosynthesis. 4. Protein metabolism- Transamination, deamination, and synthesis of amino	11 (11 Hrs)

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	acids.	
Keywords	Cell, Biomolecules, Cell Division.	

• Part C - Learning Resource
Text Books, Reference Books, Other Resources -
➢ Text Book- ➢ Biotechnology- U Satyanarayana. ➢ Cell Biology- C B Powar ➢ Cell and Molecular Biology- P K Gupta
Reference Book- • Practical Biochemistry- Wilson & Walker. o Cell biology – C.B.Powar 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- ➢ 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): 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:

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Dr. Shivani Sharma (Dr Sanjana Bhagat) Dr. Ujjwala Jaiswal

Dr Pramod Malviya

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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)		Semester: II Sem	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 - • 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** 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** 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** 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** 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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• Part C - Learning Resource
Text Books, Reference Books, Other Resources -
Text Books- ➢ 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- • 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 Daginawala • 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**	

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Dr. Shivani Sharma (Dr. Sanjaan Bhagat)

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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 – • 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	1. Preparation of mitotic index from plants and animals. 2. Preparation of slide of blood cells. 3. Preparation of slide of giant chromosomes. 4. Preparation of slide of epithelial cells. 5. Biochemical test of carbohydrates. 6. Biochemical test of lipids. 7. Biochemical test of proteins. 8. The action of salivary amylase on starch. 9. The action of trypsin on proteins. 10. Separation of amino acids by chromatography. 11. Separation of chlorophyll by chromatography.	30
Keywords	Mitotic index, Giant chromosome, biomolecules.	

• **Part C - Learning Resource**
Text Books, Reference Books, Other Resources -
➢ Text Book- ➢ Biotechnology- U Satyanarayana. ➢ Cell Biology- C B Powar ➢ Cell and Molecular Biology- P K Gupta
Reference Book- • Practical Biochemistry- Wilson & Walker. o Cell biology – C.B.Powar

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○ 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- ➢ 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

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Dr K K Patel

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 - • Maintenance of microbes. • Identification of microbes. • Isolation of nucleic acid from microbes. • Elucidations of nucleic adis 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	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- ➢ 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- • 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 Daginawala • 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 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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Dr. Ujwalasagle

Dr. Shiveni Sharma (Dr. Sanjana Bhagat) Dr Pramod malik

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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 - • 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/Training30 periods (30 Hours)		
Module	Topic (Course content)	No. of Period
Theory Contents	**Concept of biofertilizers and biopesticides** 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 *Trichoderma, Pseudomonas, and Bacillus* species as biocontrol agents. 8. Factors responsible for the effectiveness of bioagents against seed-borne and soil-borne pathogens.	15
Lab/Field Training Contents	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 experiment.	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 • S. Kannaiyan- Biofertiliser Technology-Scientific Publishers. • Environmental Biotechnology- Himalaya Publishing House.
Reference Book- • 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 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: On spot Assessment** **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**		Managed by Coordinator as per skilling

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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 - • 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** 1. General account of medicinal plant. 2. Scope of medicinal plants in the Indian market and abroad. 3. Role of medicinal plants in human health, advantage and limitation. 4. The basic theory of instrumental mechanism e.g. Soxhlet, oven, lyophilizer, etc.	08 (08 Hrs)
II	**Significance of the Indian knowledge system** 1. Extraction techniques used for secondary metabolite isolation. 2. Secondary metabolite storage. 3. Systems of Indian medicines: Ayurveda, Unani, Siddha, and Homeopathy. 4. Classification of crude drugs: Morphological, taxonomical, chemical, and pharmacological.	07 (07 Hrs)
III	**Methods for phytochemical screening** 1. Preparation technique of herbal infusions, decoctions, lotions, etc. 2. Introduction to phytochemical screening-alkaloids, polyphenolic compounds. 3. Introduction to phytochemical screening- glycosides. 4. Introduction to biological testing of herbal drugs (analgesics, anti-inflammatory and antianxiety agents).	08 (08 Hrs)
IV	**Essential industrial regulations** 1. Calibration and validation as per ICH and USFDA guidelines. 2. Production management, supply chain management & challenges 3. Government subsidy & industries,	07 (07 Hrs)

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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**
• 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 Assignment / Seminar - 05 Total Marks - 35	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
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	

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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, NO_2, O_3	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
Shaheed Nandkumar Patel
Vishwavidyalaya, Raigarh (C.G.)

Name and Signature of Convener and Members of CBOS

(Dr. Anus K. Kango) Sanjana 11/06/24 11/6/24

(Dr. Sanjana Bhagat) Dr. Shivani Sha

Dr. Ujjwala Supe Keshaw (Keshaw Kant Nag)

Neha 11/6/24 (Dr. Neha Behar) Amrita Panda 11/6/2024 (Dr Amrita Panda)

11/6/24 Dr. Shubha Diwan Dr. Pramod Mausi

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

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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):	**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:

Officer-In-Charge
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Chairman
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