DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW, UTTAR PRADESH

EVALUATION SCHEME & SYLLABUS
FOR

B. TECH. 4TH YEAR

BIOTECHNOLOGY

Based On National Education Policy (NEP2020)
(Effective from the Session: 2025-26)
DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW, UTTAR PRADESH
B. TECH. (BIOTECHNOLOGY)

SEMESTER VII														
S. No.	**Code**	**Subject**	**Learning Mode**	**LTP**			**Evaluation Scheme**						**Total**	**Credit**
				L	**T**	**P**	**CT**	**TA**	**Total**	**PS**	**TE**	**PE**		
1.	BBT701	Environmental Biotechnology	Offline	3	-	-	20	10	30	-	70	-	100	3
2.	Departmental Elective-IV	Departmental Elective-IV	Offline	3	-	-	20	10	30	-	70	-	100	3
3.	BOE**	Open Elective-II	Offline / MOOCs	3	0	0	20	10	30	-	70	-	100	3
4.	BBT751	Environmental Biotechnology Lab	Offline	0	0	2	-	-	-	50	-	50	100	1
5.	BBT752	Mini Project or Internship Assessment*		0	0	4	-	-	-	100	-	-	100	2
6.	BBT753	Project-I		0	0	10	-	-	-	150	-	-	150	5
7.	BBT754	Startup and Entrepreneurial Activity Assessment#		0	0	4	-	-	-	100	-	-	100	2
		Total		**9**	**0**	**20**							**750**	**19**
		*The Mini Project or internship (5-6 weeks) conducted during summer break after VI semester and will be assessed during VII semester. #The Startup and Entrepreneurial Activity Assessment will be done in 7th semester under which a student will have to undergo a startup/entrepreneurship activity of at least 60 hours till 6th semester												

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				L	**T**	**P**	**CT**	**TA**	**Total**	**PS**	**TE**	**PE**		
1.	BOEM**	Open Elective-III	MOOCs	3	0	0	20	10	30		70		100	3
2.	BOEM**	Open Elective-IV	MOOCs	3	0	0	20	10	30		70		100	3
3.	BBT851	Project-II		0	0	18				100		350	450	10
		Total		**6**	**0**	**18**	**24**						**650**	**16**

The Internal Assessment of MOOCs will be done by the respective institute and the External Assessment (End Semester Examination) will be done by the University.

Departmental elective IV:

1. BBT071: Genomics and Proteomics
2. BBT072: Introduction to Stem cell technology
3. BBT073: Bio-separation and Downstream Processing
4. BBT074: Industrial Biotechnology

SUBJECT CODE: BBT701	**COURSE TITLE:** Environmental Biotechnology
EXAM DURATION: 3 HOURS	**SEMESTER :** VII (ODD)
L: T: P :: 3:0:0 **CREDITS:** 3	**PRE REQUISITES:** Microbiology and Bioprocess Engineering

OBJECTIVE:

- To teach basics of environment and its challenges in terms of pollution due to various activities.
- To develop understanding of biotechnology and microbiology in treating various kind of waste Leading to production of various useful products.
- To Impart knowledge of core engineering design in environmental waste treatment using biological processes
- To develop mathematical and analytical skills required to design and operate system for source-based waste treatment.
- To Impart knowledge in the area of regulatory framework and environmental compliance.

COURSE OUTCOME: After successful completion of the course the students will be able to:

CO1	To understand basics of the environment and its challenges in terms of pollution due to various activities.	Understand
CO2	Apply the core biotechnology principles in waste treatment system.	Apply
CO3	Design the novel biological treatment system at institutional as well as industrial scale.	Create
CO4	Apply knowledge of microorganisms in process of Microbial Enhanced Oil Recovery and treatment of pollutants discharge from Industry.	Apply
CO5	Understand the regulatory mechanism in the area of environmental compliance laid down by various agencies.	Understand

DETAILED SYLLABUS

Unit	CONTENT	LECTURE
I.	**Introduction to environmental biotechnology:** Basic components of environment: Concept of ecosystem, abiotic and biotic components. Microbial Ecology and Environmental Biotechnology: Concepts and importance of microbial ecology in Environmental Biotechnology. Environmental pollution: Air, water, and soil pollution (introduction, sources, effects and measurements).	10
II.	**Waste to wealth:** bioconversion of agricultural and other highly organic waste materials into gainfully utilizable products – biogas, H_2, celluloses and food and feed stocks. Biofuels from waste: Methods and processes for utilization of waste for production of fuels, economic and social aspects of waste treatment, Community biogas plant, biogas scheme – scope of rural development.	10
III.	**Biodegradation and bioremediation:** Principle and mechanism of biodegradation of xenobiotic compounds (Lignin, Hydrocarbons, Detergents, Dyes and pesticides). Bioremediation: Fundamentals, methods and strategies of application (biostimulation, bioaugmentation) examples, bioremediation of metals (Cr, As, Se, Hg), organic pollutants (PAHs, PCBs, Pesticides, etc.), technological aspects of bioremediation (in situ, ex situ).	8
IV.	**Efficacy of microorganisms:** Microbial Enhanced Oil Recovery; Microbial role in Carbon Storage and Capture (sequestration, conversion	10

	to useful biopolymers, etc.) Aerobic and Anaerobic Degradation of Aliphatic and Aromatic Compounds. Microbial interaction with plastics, antibiotics, and other emerging pollutants.	
V.	**Environmental Impact Assessment**: Relation between development and environment. Sustainable development and carrying capacity. Environmental Protection Act, 1986, Water Prevention and Control of Pollution Act, 1974, Water Prevention and Control of Pollution Cess Act, 1974, Air Prevention and Control of Pollution Act, 1981, Hazardous Wastes (Management and Handling) Rules. International environmental laws.	8
	Total lectures	46

Reference Books

S.No.	NAME OF AUTHORS/BOOKS/PUBLISHERS	YEAR OF PUBLICATION
1.	Karrely D., Chakrabarty K., Omen G.S., Biotechnology and Biodegradation, Advances in Applied Biotechnology Series, Vol.4, Gulf Publications Co. London.	2009
2.	WasteWater Engineering Metcalf & Eddy, 3rd ed.	2013
3.	B.C.Bhattacharyya and R.Banerjee, "Environmental Biotechnology",	2007
4.	Foster C.F., John Ware D.A., Environmental Biotechnology, Ellis Horwood Ltd.	2007
5.	Environmental Biotechnology, Principles and Applications by Bruce E Rittman and Perry L McCarty, McGrawhill Higher education.	2020
6.	Essentials of Ecology & Environmental Science, S.V.S. Rana, Prentic-Hall India.	2006
7.	Bioremediation and Natural Attenuation by Pedro J J Alvarage and Walter A Illman, Wiley Interscience.	2006
8.	R.M.Maier,I.L.Pepper and C.P.Gerba, Elsevier "Environmental Microbiology:A Laboratory Manual", 2nd Edition, Academic Press.	2004

SUBJECT CODE: BBT071	COURSE TITLE: Genomics & Proteomics
EXAM DURATION: 3 HOURS	SEMESTER: VII (ODD)
L: T: P :: 3 : 0: 0 CREDIT: 3	PRE-REQUISITE: Molecular Biology & Biochemistry

OBJECTIVE:

- To teach basics of genomics and proteomics, their origin and applications.
- To develop understanding of fingerprinting and genome sequencing.
- To impart knowledge of peptide analysis and differential display proteomics.
- To demonstrate various techniques for high throughput analysis and protein sequencing.
- To brief about the emerging streams in genomics and proteomics, their techniques and applications.

COURSE OUTCOME: After completion of this course successfully, the students will be able to:

CO1	Acquire the knowledge for genes, their origin and genome annotation techniques.	Understand
CO2	To understand the basic concept of molecular markers, DNA fingerprinting and Genome projects.	Understand & Apply
CO3	Apply the core proteomics principles for peptide fingerprinting and protein-protein interactions.	Create
CO4	To impart knowledge of microarray, its variants, process, data analysis and pharmacogenomics.	Apply
CO5	To understand the basic concepts of various new fields like metagenomics, metabonomics and systems biology.	Understand

DETAILED SYLLABUS

Unit	CONTANT	LECTURE
I.	Origin of genomes, Acquisition of new genes, DNA sequencing – chemical and enzymatic methods, The origins of introns, Genetics to genomics to functional genomics. Forward genetics (Phenotype to gene structure) and Reverse genetics (Gene structure to phenotype). Chromosome structure and Genome organization, Genome sequencing methods, Genome assembly, Gene identification methods, Sequences Comparison Techniques, Genome annotation techniques.	10
II.	Introduction to molecular markers-RFLP, RAPD, AFLP, SSRs and others. Genetic and physical maps, map based cloning, mapping population, southern and in situ hybridization for genome analysis, DNA fingerprinting; Single nucleotide polymorphisms, RNA interference, antisense RNA, siRNA, MiRNA, ; Human Genome Project; Pharmacogenomics: Ethical considerations of genetic testing; Genomics in drug discovery.	10
III.	Proteomics Protein analysis (includes measurement of concentration, amino- acid composition, N-terminal sequencing); 2-D electrophoresis of proteins; Micro-scale solution iso-electric focusing; Peptide fingerprinting; LC/MS-MS for identification of proteins and modified proteins; MALDITOF; SAGE and Differential display proteomics, Yeast two hybrid system.	10
IV.	Microarray, Pharmacogenetics High throughput screening in genome for drug discovery - identification of gene targets, Pharmacogenetics and drug development.	8

V.	Protein-protein and protein-DNA interactions; protein chips and functional proteomics; clinical and biomedical applications of proteomics; introduction to metabolomics, lipidomics, metagenomics and systems biology.	8
	Total lectures	46

Reference Books:

S.No	**NAME OF AUTHORS/BOOKS/PUBLISHERS**	**YEAR OF PUBLICATION**
1.	Voet D, Voet JG & Pratt CW, Fundamentals of Biochemistry, 2nd ed. Wiley	2006
2.	Introduction to Genomics Arthur M Lesk Oxford University Press	2007
3.	Brown TA, Genomes, 3rd ed. Garland Science	2006
4.	Campbell AM & Heyer LJ, Discovering Genomics, Proteomics and Bioinformatics, 2nd ed. Benjamin Cummings	2007
5.	Primrose S & Twyman R, Principles of Gene Manipulation and Genomics, 7th ed, Blackwell	2006
6.	Glick BR & Pasternak JJ, Molecular Biotechnology, 3rd ed, ASM Press	1998

SUBJECT CODE: BBT072	**COURSE TITLE: Bioseperation & Down Stream Processing**
EXAM DURATION: 3 HOURS	**SEMESTER :** VII (ODD)
L: T: P :: 3:0:0 **CREDITS:** 3	**PRE REQUISITES:** This course is designed for undergraduates with reasonably strong background in biology.

OBJECTIVE:

- The major objective of this course is to impart in students the skills to operate bioprocesses for production of various Bio-products
- This course is formulated to teach various methods of product separation, isolation and purification To teach the construction of genomic c-DNA libraries, cloning and strain improvement

COURSE OUTCOME: After successful completion of the course the students will be able to:

CO1	To operate, design and optimize the production medium, they will gain the ability to handle bioreactors to carry out different separation processes involving various types of bioproducts.	Understand & Analyze
CO2	The students will be skilled in choosing a process of separation for a particular product, they will know how to design the relevant equipment, calculate the yield, and degree of purification.	Understand, Analyze & Create

DETAILED SYLLABUS

Units	CONTENT	LECTURE
I.	**INTRODUCTION TO BIOSEPARATION PROCESS:** Role and importance of bioseparation in biotechnological processes: RIPP scheme, Problems and requirements of bioproducts purification - Properties of Biomolecules - Characteristics of fermentation broth - Biological activity, Analysis of purity-Process economics: Capital and operating cost analysis.	8
II.	**REMOVAL OF INSOUBLES:** Cell disruption methods for intracellular products: Physical, chemical and mechanical - Removal of insolubles: Biomass and particulate debris separation techniques - flocculation - sedimentation - centrifugation and filtration methods.	8
III.	**ISOLATION OF PRODUCTS:** Adsorption: Principles - Langumir - Freundlich isotherms - Extraction: Basics- Batch and continuous, aqueous two-phase extraction - supercritical extraction - in situ product removal - Precipitation: Methods of precipitation with salts - organic solvents and polymers - Membrane based separations: Micro and ultra filtration - theory - design and configuration of membrane separation equipments and its applications.	8
IV.	**PURIFICATION OF BIOPRODUCTS:** Basic principles of Chromatographic separations: GC-HPLC - gel permeation - ion- exchange - affinity - reverse phase and hydrophobic interaction chromatography - Electrophoretic separation techniques: capillary - isoelectric focusing-2D gel electrophoresis - Hybrid separation technologies: GC-MS and LC-MS.	8
V.	**PRODUCT POLISHING: Crystallization:** Principles-Nucleation- Crystal growth-Kinetics-Batch crystallizers: Scale-up and design, Drying: PrinciplesWater in biological solids- Heat and mass transfer- Drying	8

	equipments: description and operation-Vacuum shelf - rotary dryer-Freeze dryer-Spray dryer. Biomolecules of Commercial importance Ethanol, citric acid, lysine, steroids, penicillin, dextran, trehalose, subtilisin, chymosin, vitamin B12, hepatitis B vaccine, insulin, erythropoietin, monoclonal antibodies.	
	Total lectures	40

Reference Books:

S.No	**NAME OF AUTHORS/BOOKS/PUBLISHERS**	**YEAR OF PUBLICATION**
1.	Raja Ghosh, "Principles of Bioseparations Engineering", World Scientific Publishing	2006
2.	Ladisch. M. R, "Bioseparation Engineering: Principles, Practice and Economics", John Wiley & sons, New York	2001
3.	Asenjo.J.M, "Separation processes in Biotechnology" Marcel Dekker Inc	1993
4.	Bailey & oils, Biochemical Engg. Fundamentals, McGraw-Hill	1990
5.	Roger G. Harrison, Paul Todd, Scott R. Rudge, Demetri P. Petrides, "Bioseparation science and Engineering" Oxford University press.	2003

SUBJECT CODE: BBT073	**COURSE TITLE:** Introduction to Stem Cells
EXAM DURATION: 3 HOURS	**SEMESTER :** VII (ODD)
L: T: P :: 3:0:0 **CREDITS:** 3	**PRE REQUISITES:** This course is designed for undergraduates with reasonably strong background in biology.

OBJECTIVE: This course is designed for students to provide an introduction to the role of stem cells in tissue growth and repair, the stem cells based therapy and in vitro construction of tissue and organ replacements, and the ethics and regulations in stem cells applications and research. By studying this course students should be able to supplement their future job/research endeavors with the subject's knowledge.

COURSE OUTCOME: After successful completion of the course the students will be able to:

CO1	Understand the techniques used for the isolation, culture and manipulation of stem cells for use in disease therapy.	Understand
CO2	Demonstrate the knowledge of adult cell reprogramming for producing stem cells for clinical use & Analyze and discuss the safety, ethical and legal considerations in human stem cell research and therapy.	Understand & Analyze
CO3	Demonstrate comprehensive knowledge of stem cell biology, including their self-renewal, differentiation, and therapeutic potential & Apply advanced techniques for the isolation, culture, and genetic engineering of stem cells.	Create
CO4	Integrate stem cells with biomaterials and bioreactors for tissue engineering and regenerative medicine applications.	Create
CO5	Analyze and address clinical, ethical, and regulatory challenges in the translation of stem cell research into therapies	Analyze

DETAILED SYLLABUS

Units	CONTENT	LECTURE
VI.	Introduction to Stem Cells: Properties, Classification and Sources Embryonic Stem Cells: Blastocyst and inner cell mass cells; Early embryogenesis; Organogenesis; Mammalian Nuclear Transfer Technology Adult Stem Cells: Stem cell differentiation, potency and aging, Nuclear reprogramming and gene editing Stem cells, Checkpoints and signaling in stem cells, Cryopreservation: Basic techniques, Cryoinjury, Cord blood cells cryopreservation	10
VII.	Clinical Applications of Stem cells: Immune barriers of stem cell therapy, Engineering stem cell niche, Neurological disorders: Parkinson's, Alzheimer's, Huntington's, Amyotrophic Lateral Sclerosis, Spinal Code Injury; Tissue systems failures: Organ failure, Diabetes, Cardiomyopathy, Hemophilia, Cancer Tissue Engineering: Introduction, Biomaterials, Biomaterial-tissue interface, Micro-scale technologies, Tissue repair and regeneration, Clinical applications and case studies	10
VIII.	Stem Cells in Tissue Engineering and Regenerative Medicine Applications in cartilage, bone, neural, and cardiac tissue regeneration, Integration of stem cells with scaffolds and bioreactors, Role of growth factors and signaling pathways in directing stem cell fate	8

IX.	Primordial germ cells as stem cells, embryonal carcinoma cells as embryonic stem cells, trophoblast stem cells. Hematopoietic Stem Cells; Repopulating patterns of primitive hematopoietic stem cells, molecular diversification and developmental interrelationships, lymphopoiesis and the problem of commitment versus plasticity, hemangioblast, mesenchymal stem cells of human adult bone marrow, stem cells and neurogenesis. Epidermal Stem Cells: Liver stem cells, pancreatic stem cells, stem cells in the epithelium of the small intestine and colon.	10
X.	Biomedical applications of stem cells: Stem cell applications in understanding human developmental biology, high throughput drug screening and discovery, disease modeling and regenerative medicine; Genetically engineered stem cells; Current stem cell based clinical trials; Stem cells research ethics and guidelines; Controversies and ethical considerations, Stem cell research guidelines; Current challenges in clinical applications.	10
	Total lectures	48

Reference Books:

S.No	NAME OF AUTHORS/BOOKS/PUBLISHERS	YEAR OF PUBLICATION
6.	Stewart Sell, Stem Cells Handbook, Humana Press; Oct. 2003	2003
7.	Daniel R. Marshak, Richard L. Gardner and David Gottlieb, Stem Cell Biology, Cold Spring Harbor Laboratory Press, Cold Spring Harbor NY, USA; 2001	2001
8.	Stem Cells and the Future of Regenerative Medicine, Committee on the Biological and Biomedical Applications of Stem Cell Research, Board on Life Sciences, National Academies Press	2002
9.	A.A. Vertes, N. Qureshi, A.I. Caplan, L. Babiss. Stem Cells in Regenerative Medicine: Science, Regulation and Business Strategies. Wiley-Blackwell.	2015
10.	Gabriela Rodrigues, Bernard A. J. Roelen, Concepts and Applications of Stem Cell Biology: A Guide for Students, Springer; 1st Edition.	2020
11.	R. Lanza and A. Atala. Essentials of Stem Cell Biology (3rd Ed.). Academic Press.	2013
12.	Song Li, Nicolas L'Heureux, Jenniffer Ellisseeff, *Stem cell and Tissue Engineering*, , WorldScientific	2011
13.	Gerhard M. Artmann, Stephen Minger, Jürgen Heschele, *Stem Cell Engineering: Principles and Applications*, Springer	2010
14.	Insoo Hyun, *Bioethics and the Future of Stem Cell Research*, Cambridge University Press	2013
15.	Mary Clarke, Jonathan Frampton, Stem Cells Biology and Application, Garland Science, 1st Edition	2020

SUBJECT CODE: BBT074	**COURSE TITLE:** Industrial Biotechnology
EXAM DURATION: 3 HOURS	**SEMESTER :** VII (ODD)
L: T: P :: 3:0:0 **CREDITS:** 3	**PRE REQUISITES:** Knowledge of Microbiology, Biochemistry, Fermentation Biotechnology

OBJECTIVE:

- To provide the knowledge of Industrial Biotechnology.
- To understand the use of living cells such as bacteria, yeast, algae or component of cells like enzymes, plants and animals to generate industrial products and processes.
- To study techniques for genetic improvement of micro-organisms to improve yield of bioproducts.
- To provide the knowledge of microbial production of pharmaceuticals.
- To provide knowledge about biofuels.

COURSE OUTCOME: After successful completion of the course the students will be able to:

CO1	Understand the role of industrial biotechnology in improving microbial cells as factories	Understand
CO2	Understand the different types of bioreactors and the production aspects of commodity chemicals, pharmaceuticals and fine chemicals.	Understand & Analyze
CO3	Apply knowledge of microorganisms in commercial production of flavours, fragrance, and microbial pigment in textile and industry.	Create
CO4	Apply the process for commercial production of enzyme.	Apply
CO5	Understand the concept of biofuels and the process of Microbial Enhanced Oil Recovery and Microbial Leaching.	Understand, Analyze & Create

DETAILED SYLLABUS

Unit	CONTENT	LECTURE
I.	**Introduction to Industrial Biotechnology:** Introduction and scope of industrial biotechnology, historical overview of industrial fermentation processes, unit operations involved, products and market economics. **Microorganisms:** Isolation of industrially important microorganisms, isolation methods utilizing selection of desired characteristics, methods not utilizing selection of desired characteristics, preservation and maintenance of microorganisms, improvement of industrial microorganisms for overproduction of primary and secondary metabolites, improvement of strains by modifying properties other than the yield of products.	12
II.	**Raw materials for fermentation process:** Media requirements for fermentation processes, simple and complex media, medium formulation, carbon sources, nitrogen sources, minerals, vitamins and other nutrients, precursor, induces, chelator, growth factors, antifoams.	8
III.	**Commercially important products:** Alcohol, alcoholic beverages beer and wines etc, beneficial soil microorganisms. bio pesticides, biofertilizer, single cell proteins, baker's yeast, high fructose corn syrup, organic acids, acetone, butanol etc., biopreservatives (Nisin), cheese, biopolymers (xanthan gum, PHB etc), Bioflavours and biopigments; microbial production of flavours and fragrances; microbial pigments in textile and food industry.	10
IV.	**Microbial production of pharmaceuticals and other bioproducts:**	8

	Antibiotics, vitamins, enzyme and proteins, enzyme inhibitors and specialty chemicals; Transformation of nonsteroidal compounds, antibiotics, genetic engineering of microorganisms for production of nonribosomal peptides (NRPS) and polyketides (PKS), anticancer drugs.	
V.	Bioreactors, Production of cell biomass and Bioenergy: Different type of Bioreactors and Bioreactor design, Production of ethanol, acetone, butanol, citric acid, dextran and amino acids, fuel from biomass, production and economics of biofuels, biogas, bio-refineries, Microbial Enhanced Oil Recovery (MEOR).	10
	Total lectures	48

Reference Books:

S.No	**NAME OF AUTHORS/BOOKS/PUBLISHERS**	**YEAR OF PUBLICATION**
1.	Reed G, "Prescott and Dunn's Industrial Microbiology" CBS publishers and distributors, New Delhi (1987). ,	1987
2.	P.F. Stansbury and A. Whitaker, Principles of Fermentation Technology: An Introduction to Current Concepts, Pergamon Press 1993	1993
3.	Glazer AN, Nikaido H : Microbial Biotechnology: Fundamentals of Applied Microbiology. 2007	2007
4.	Malden MA: Industrial Microbiology: An introduction; Blackwell Science 2001	2001
5.	Casida L E, "Industrial Microbiology" , New Age International Publishers Ltd.	2003
6.	Mansi E M T EL, Bryce C F A, "Fermentation Microbiology and Biotechnology". Ane Books Publishers and Distributors	2003
7.	Shuler M L, Kargi F, " Bioprocess Engineering- Basic Concepts" , 2nd ed, Prentice Hall of India Ltd.	2002
8.	C. Vogel and C.L. Tadaro, Fermentation and Biochemical Engineering Handbook: Principles, Process, Design and Equipment, Noyes Publications	1996
9.	Wulf Cruger and Anneliese Crueger, Biotechnology: A Textbook of Industrial Microbiology, Panima Publishing Corporation	2003
10.	Crueger W and Crueger A, "Biotechnology: A Text book of Industrial Microbiology" Sinouer Associate, Inc. Sunderland MA, USA	1990

SUBJECT CODE: BBT751	**COURSE TITLE: Environmental Biotechnology Lab**
EXAM DURATION: 2 HOURS	**SEMESTER :** VII (ODD)
L: T: P :: 0:0:0 **CREDITS:** 1	**PRE REQUISITES:** Basic knowledge of Microbiology and Bioprocess engineering

OBJECTIVE:

- Hands on experience on water & soil treatments using environmental friendly methods.
- This course is designed to give the students hands-on experience regarding monitoring of environmental parameters as part of field studies

COURSE OUTCOME: After successful completion of the course the students will be able to:

CO1	Learn about various environment friendly methods for Environmental Biotechnology.	Understand & Analyze
CO2	Identify and appreciate the parameters for assessing environment.	Understand & Analyze

S.No.	**LIST OF EXPERIMENTS**
1.	Isolation, Identification, characterization of microbes collected from nearby polluted area/ industries and study of their enzymes.
2.	Environmental influence and control of microbial growth.
3.	Microbial degradation of textile dyes/pesticides/hydrocarbons and oils
4.	To determine BOD value for determining biodegradability of solution
5.	To determine COD value for determining organic strength of solution (Closed Reflux Method)
6.	Determination of metals in waste water and their removal.
7.	Effluent treatment plant (ETP): Primary, chemical and biological treatment
8.	Soil Quality analysis.
9.	Water Quality analysis
10.	Field Trip : (A) Wastewater Treatment Plant (B) How the community deals with domestic solid waste (Collection, disposal and treatment)