SANKALCHAND PATEL UNIVERSITY, VISNAGAR

Faculty of Science and Humanities

Structure, Teaching Scheme and Syllabus of

B.Sc. (Honours and Honours with Research) Biotechnology

Semester- 7

as per NEP 2020

Program Code: SC101

With effect from:2023-24

Faculty of Science and Humanities
B.Sc. (Biotechnology) (Semester - 7)
In Effect from Academic Year 2023-24

Branch Name:	B.Sc. Biotechnology
Program Code:	SC101
Course Name:	IPR and Biosafety
Course Code:	17-BIM401-4C
Pre-requisite Course:	

Course Objectives:

- To learn the social responsibility of researchers and the bioethics.
- Students will also be learning biosafety guidelines with special emphasis on individuals, institutions and the society.
- To learn about Intellectual Property Rights and Patenting for all the students of Microbiology and Biotechnology.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				**Evaluation Scheme (Marks)**				
				Theory (Marks)		**Practical (Marks)**		
Lecture (L)	**Tutorial (T)**	**Practical (P)**	**Credit**	**University Assessment**	**Continuous Assessment**	**University Assessment**	**Continuous Assessment**	**Total (Marks)**
3	-	2	4	50	25	--	25	100

Subject Contents:

Unit	Content	Lectures	Weightage
1	Biosafety: • Introduction, History • Definitions, Objectives • Risk Assessment Containment • Planned introduction of GMO • Biosafety during Industrial Production using GMO • Guideline in India	15	33%
2	Intellectual Property Rights: • Introduction to IPR • IPR, forms of IPR and Intellectual property protection • Interaction and Hormonization of Patent Laws • Protection of Biotechnological Inventions • Plant Breeder's Right • Management, Benefits, Problems of IPR • Concept of property with respect to intellectual creativity, Tangible and Intangible property. • Introduction to WTO, TRIP, WIPO, EPO	15	33%

3	Patenting: • Concept related to patents novelty, non-obviousness, utility, anticipation, prior art, novelty search report preparation patent drafting, patent prosecution and filing, Commercialization and licensing, etc. • Type of patents. • Indian Patent Law • Industrial design act • Trademark act • Copyright act • Geographical Indications • IC circuit designs and plant variety • Patent search engines and its uses.	15	34%

List of Experiments:

- Learning the core objectives of IPR
- To Access and Downloads the Patents online
- To Understand the basic concepts related to patenting
- To understand the Biosafety guideline with laboratory and industry perspective
- Knowledge through seminar, workshop etc.

Textbooks:

- B.D. Singh. Biotechnology expanding horizons.
- H. K. Das. Text book of biotechnology 3rd edition.
- Biotechnology by U Satyanarayana and U. Chakrapani

Reference Books:

- Fleming, D.A., Hunt, D.L., (2000). Biotechnology and Safety Assessment (3rd Ed) Academic press. ISBN-1555811804,9781555811808.
- Thomas, J.A., Fuch, R.L. (1999). Biotechnology and safety assessment (3rd Ed). CRC press, Washington. ISBN: 1560327219, 9781560327219
- Law and Strategy of biotechnological patents by Sibley. Butterworth publication. (2007) ISBN: 075069440, 9780750694445.
- Intellectual property rights- Ganguli-Tat McGrawhill. (2001) ISBN-10: 0074638602,
- Intellectual Property Right- Wattal- Oxford Publicatiopn House. (1997) ISBN:0195905024.
- Biotechnology - A comprehensive treatise (Vol. 12). Legal economic and ethical dimensions VCH. (2nd ed) ISBN-10 3527304320.
- Encyclopedia of Bioethics 5 vol set, (2003) ISBN-10: 0028657748.
- Thomas, J.A., Fuch, R.L. (2002). Biotechnology and safety Assessment (3rd Ed) Academic press.

List of Open-Source Software/learning website:

- https://archive.nptel.ac.in/noc/courses/noc22/SEM1/noc22-hs59/
- https://archive.nptel.ac.in/noc/courses/noc22/SEM1/noc22-hs62/
- https://archive.nptel.ac.in/noc/courses/noc22/SEM1/noc22-hs05/

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Define and explain the fundamental concepts, history, objectives, and regulatory frameworks of biosafety, including risk assessment and containment strategies.	1 Remember 2 Understand
CLO2	Explain, apply, and analyze biosafety principles in the planned introduction and industrial use of genetically modified organisms (GMOs), with reference to national guidelines in India.	2 Understand 3 Apply 4 Analyze
CLO3	Define, explain, and apply the concepts of intellectual property rights, including various forms of IPR and their role in protecting intellectual creativity and innovation.	1 Remember 2 Understand 3 Apply
CLO4	Explain, apply, analyze, and evaluate international and national IPR frameworks, including WTO, TRIPS, WIPO, and Indian regulations governing biotechnological inventions and plant breeder's rights.	2 Understand 3 Apply 4 Analyze 5 Evaluate
CLO5	Explain, apply, analyze, and evaluate patent-related concepts such as novelty, non-obviousness, utility, prior art, and demonstrate understanding of patent drafting, filing, prosecution, and commercialization processes.	2 Understand 3Apply 4 Analyze 5 Evaluate
CLO6	Apply, analyze, evaluate, and design strategies for intellectual property protection by integrating knowledge of patent laws, trademarks, copyrights, geographical indications, industrial design, and patent search tools in real-world scenarios.	3Apply 4 Analyse 5 Evaluate 6 Create

Mapping of CLO s with POs & PSOs

Course Learning Outcomes	Programme Outcomes (POs)																Programme Specific Outcome (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	PSO1	PSO2	PSO3
CLO1	1	2	3		1				3			3					3	1	2
CLO2	1	2	1		2	1							1	2			3	2	2
CLO3	1	2	2	1	2	1	2						1						
CLO4	1			3	2	1	3	1			1		2						
CLO5	1	3	1	2	1	2		1		1	1		2		1	1	1		
CLO6	1	2	1	3		1	1		2	3	1		1				1		

3: High, 2: Medium, 1: Low

Faculty of Science and Humanities
B.Sc. (Biotechnology) (Semester - 7)
In Effect from Academic Year 2023-24

Branch Name:	B.Sc. Biotechnology
Program Code:	SC101
Course Name:	Metabolism and Metabolic Regulation
Course Code:	17-BIM402-4C
Pre-requisite Course:	

Course Objectives:

- To understand Concept of Metabolic Regulation
- To understand Carbohydrates metabolism
- To understand Nitrogen and Sulfur metabolism
- To understand lipid and Nucleotides metabolism

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
				Theory (Marks)		Practical (Marks)		
Lecture (L)	Tutorial (T)	Practical (P)	Credit	University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	Total (Marks)
3	-	2	4	50	25	--	25	100

Subject Contents:

Unit	Content	Lectures	Weightage
1	**Metabolic Regulation** • Major Modes of Gene Regulation • Negative & Positive control of transcription • Regulation of Enzyme activity: Reversible Non-covalent inhibition. (Allosteric) & Reversible Covalent Modification of Enzymes • Regulation of glycolysis and gluconeogenesis • Regulation of Citric acid cycle • Quorum sensing: Mechanism & Examples • Regulation of Bacterial Chemotaxis	15	33%
2	**Carbohydrate Metabolism** • Metabolism of sugars other than glucose • Fermentation Pathways. **Lipid metabolism** • Oxidation of Fatty Acids: α-, β- & ω- mode of Fatty Acid Oxidation and their energetics **Protein Metabolism** • Protein Degradation • Overview of amino acid biosynthesis, biosynthesis of six essential amino acid from oxaloacetate and pyruvate, synthesis of tryptophan, phenylalanine, and Tyrosine **Nucleotide metabolism** • Degradation of nucleotides.	15	33%

3	**Nitrogen and Sulfur metabolism** • Nitrogen and Sulfur metabolism • Biological Nitrogen fixation: The Nitrogen Fixation process, Symbiotic Nitrogen Fixation, Inorganic Nitrogen Metabolism, Assimilation of Inorganic Nitrogen, Regulation of Nitrogen fixation • General Reactions of Amino Acids: Amino Acid Decarboxylases, Amino Acid Deaminases, Amino Acid Transaminases (Aminotransferases), Amino Acid Racemases, Role of pyridoxal-5'-Phosphate in Enzymatic Reactions with Amino Acids, The Stickland Reaction. • Sulfur Metabolism: Sulfate assimilation, Sulfide formation and sulphide consumption by bacteria, Dissilmilatory sulfate reduction, Microbial sulphur oxidation.	15	34%

List of Experiments:

- Estimation of Non reducing Sugars by Anthrone Method.
- Estimation of Glucose by Nelson-Somogyi's Method
- Quantitative analysis of Amino acids
- Isolation and characterization of Symbiotic nitrogen fixers
- Isolation and characterization of non-symbiotic nitrogen fixers
- Nitrate Reduction Test
- Hydrogen Sulfide (H_2S) Production Test
- Regulation of Enzyme Activity (Induction Study – β-galactosidase)
- Comparative Study of Carbon Source Utilization other than Glucose with Glucose.

Textbooks:

- Microbial Physiology by Albert G. Moat and John W. Foster. Third edition, John Wiley and Sons; 2002
- Lehninger-Principles of Biochemistry by David L. Nelson and Michael M. Cox. Fifth Edition, W.H. Freeman and Company; 2008.
- Brocks Biology of Microorganisms, 8th Edition, (International Edition - 1997) by Michael T. Madigan, John M. Martinko and Jack Parker, Prentice Hall International Inc.

Reference Books:

- The Physiology and Biochemistry of Prokaryotes by David White. Second Edition, Oxford University Press; 2000.
- Biochemistry by Geoffrey L. Zubay. Fourth Edition, Addison-Wesley educational publishers Inc., 2008
- Microbial lipids edited by C. Ratledge and SG Wilkinson, second edition, Academic Press; 1988.
- Biochemical Calculations by Irwin Segel., John Wiley and Sons, California, USA, 2004.
- Guide to Protein Purification by M. P. Deutcher., Academic Press, San Diego, USA, 1993.

List of Open-Source Software/learning website:

- https://nptel.ac.in/courses/104105076
- https://www.lecturio.com/medical-courses/metabolic-control.course#/
- https://microbiologyonline.ifas.ufl.edu/programs/courses/metabolic-regulation/
- https://www.coursera.org/learn/energy-metabolism

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Identify, describe, and interpret the fundamental mechanisms governing gene expression and regulation in microbial systems, including transcriptional control, quorum sensing, and chemotactic responses.	1 Remember 2 Understand
CLO2	Explain, utilize, and examine regulatory mechanisms of enzyme activity, including allosteric interactions and covalent modifications, in the control of central metabolic pathways.	2 Understand 3 Apply 4 Analyze
CLO3	Explain, apply, and critically analyze carbohydrate metabolic pathways, including alternative sugar utilization and fermentation processes, in relation to cellular energy requirements.	2 Understand 3 Apply 4 Analyze
CLO4	Apply, analyze, and assess lipid and protein metabolic processes, including fatty acid oxidation pathways and amino acid biosynthesis and degradation, with respect to metabolic efficiency and regulation.	3 Apply 4 Analyze 5 Evaluate
CLO5	Explain, analyze, and critically evaluate nitrogen and nucleotide metabolism, including biological nitrogen fixation and amino acid transformations, in the context of cellular and environmental significance.	2 Understand 4 Analyze 5 Evaluate
CLO6	Analyze, evaluate, and formulate integrated metabolic networks and control pathways and pathways involving sulfur metabolism and interrelated biochemical pathways, demonstrating systems-level understanding.	4 Analyse 5 Evaluate 6 Create

Mapping of CLO s with POs & PSOs

Course Learning Outcomes	Programme Outcomes (POs)																Programme Specific Outcome (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	PSO1	PSO2	PSO3
CLO1	3	1			1	1												1	
CLO2		2			2	1											1	2	
CLO3		2			2	1												2	
CLO4		2			2	1													
CLO5	3	2			2	1								1				2	
CLO6	3	3			2	3								1			1	1	

3: High, 2: Medium, 1: Low

Faculty of Science and Humanities
B.Sc. (Biotechnology) (Semester - 7)
In Effect from Academic Year 2023-24

Branch Name:	B.Sc. Biotechnology
Program Code:	SC101
Course Name:	Omics
Course Code:	17-BIM403-4C
Pre-requisite Course:	Basics Biotechnology up to 12th Science.

Course Objectives:

- To introduce the fundamental concepts of computers relevant to bioinformatics.
- To provide information about bioinformatics, and biological databases
- To explain methods for retrieval and analysis of biological information.
- To develop skills for use of various basic and advance bioinformatics tools.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
				Theory (Marks)		Practical (Marks)		
Lecture (L)	Tutorial (T)	Practical (P)	Credit	University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	Total (Marks)
3	--	2	4	50	25	-	25	100

Subject Contents:

Unit	Content	Lectures	Weightage
1	**Introduction to Computers** **Components of computer** (CPU, memory, I/O devices) **Types of computers:** workstation, clusters, supercomputers Introduction to high performance computing (HPC) in biology **Modern Computers:** Workstations, parallel processing computers, supercomputers. **Operating systems and basic functions:** Windows, Linux/Unix environment, File systems and directories, Basic Linux commands (ls, cd, mkdir, cp, rm, grep) **Computer Networks & Internet: WWW, HTTP, FTP; Cloud computing in bioinformatics** **Programming Basics for Bioinformatics** • Number systems (brief) • Introduction to scripting languages • Basics of Python and R for biological data analysis	15	25%

2	**Bioinformatics:** Introduction, Overview, History, Scope/ needs and Applications of bioinformatics, Biological data types (DNA, RNA, protein), Introduction to Omics (Genomics, Proteomics, Transcriptomics, Metabolomics, Metagenomics, Metaproteomics, Metatranscriptomics) **Mode of data storage -** Sequence formats and retrieval, requirements of tools and software, File formats - FASTA, Genbank and Uniprot, Data submission & retrieval from NCBI, EMBL, DDBJ, Uniprot, PDB. ***In Silico* Resources for the Information** **Biological Databases:** Introduction, significance, types of databases **Nucleotide sequence database:** EMBL, gene bank, DDBJ Protein Database **Protein sequence database**: PIR, Swiss-Prot, CDD **Structure database:** PDB, MMDB, Classification database: CATH, SCOPE\ **Metabolic pathway Database:** KEGG **Chemical Database:** ZINC, PUBCHEM **Mechanism of submitting the biological data to the database**: Data Standardization & Formatting, Validation, Deposition, Accession	15	35%
3	**Primary Tools of bioinformatics** **Sequence Alignment & Similarity Search:** Pairwise sequence Alignment: Dynamic programming Algorithm, Multiple sequence alignments (MSA): Global Multiple sequence alignments and introductionto CLUSTALW and PileUp, Local Multiple sequence alignments and introduction to BLOCKS, eMOTIF, MEME, GIBBS, HMM **Molecular Visualization & Structural Analysis:** PyMOL, Swiss-PdbViewer (DeepView), RasMol **Secondary structure prediction:** Computation methods for secondary structure prediction: Chou Fasman, GOR and Softwares for Secondary structure prediction **Protein Modeling:** Methods for Protein Modeling, Homology Modeling; fold recognition and threading approaches, and Ab-initio structure prediction methods. **Molecular Interaction and Docking**: Simulation techniques, Softwares for Structure based drug design and molecular docking, Autodock and Drug Bank	15	40%

List of Experiments:

1. Study of basic computer components and operating systems.
2. Introduction to Linux/Unix operating system and basic commands.
3. Number system conversion and binary arithmetic.
4. Basic scripting/programming for biological data analysis.
5. Retrieval of nucleotide sequences from biological databases.
6. Retrieval and analysis of protein sequences from UniProt database.
7. Retrieval of protein structure from Protein Data Bank (PDB).
8. Exploration of metabolic pathway databases (KEGG) and chemical databases.
9. Sequence similarity search using BLAST.
10. Multiple sequence alignment using ClustalW.
11. Visualization of protein structures using PyMOL/RasMol.
12. Prediction of protein secondary structure using computational tools.
13. Homology modeling of protein structures.
14. Molecular docking analysis using AutoDock.

Text Books:

- Developing Bioinformatics Computer Skills C. Gibas and P. Jamback.
- Pevzner, P., & Shamir, R. (2011). *Bioinformatics for biologists*. Cambridge University Press.

Reference Books:

- Bioinformatics A machine learning approach P. Baldi & S. Bruna
- Bioinformatics: A Practical guide to the analysis oflienes and Proteins A. D. Bzxevanis and B. F. F. Onellette
- Bioinformatics Methods and protocols: Methods inmolecular biology Vol. 132:S. Misenes and S. A. Krawetz (Eds

List of Open-Source Software/learning website:

- https://www.youtube.com/watch?v=lhU3CzslFqw
- https://www.ncbi.nlm.nih.gov/
- https://www.ncbi.nlm.nih.gov/home/learn/
- https://www.bioinformatics.org/
- https://www.genome.jp/kegg/
- https://www.expasy.org/
- https://www.ddbj.nig.ac.jp/index-e.html

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	**Explain** the fundamental concepts of computers, operating systems, number systems, and basic programming relevant to bioinformatics.	1 Remember 2 Understand
CLO2	**Describe** the scope, applications, and need of bioinformatics and omics technologies	2 Understand
CLO3	**Identify** and retrieve biological data from biological databases.	3 Apply
CLO4	**Demonstrate** the use of bioinformatics tools for sequence similarity search and sequence alignment.	3 Apply
CLO5	**Analyze** protein structures and predict secondary structures using computational tools and visualization software.	4 Analyze
CLO6	**Apply** computational approaches such as homology modeling and molecular docking in structure-based drug design studies.	5 Evaluate 6 Create

Mapping of CLO s with POs & PSOs

Course Learning Outcomes	Programme Outcomes (POs)																Programme Specific Outcome (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	PSO1	PSO2	PSO3
CLO1						1			3	3							1	1	
CLO2		2	1		2	1			3	3							1	1	
CLO3	1	2	1		2	1			3	3								1	
CLO4	2	2	1		2	1			3	3							1	1	
CLO5	3	3	3		3	3			3	3								1	
CLO6	3	3	3		3	3			3	3							2	1	

3: High, 2: Medium, 1: Low

Branch Name:	B.Sc. Biotechnology
Program Code:	SC101
Course Name:	Ecology Ecosystem and its Conservation
Course Code:	17-MIE401-4C
Pre-requisite Course:	

Course Objectives:

- Understand fundamental ecological principles and ecosystem functioning.
- Learn population dynamics, biodiversity, and ecological interactions.
- Recognize environmental pollution and global ecological challenges.
- Develop awareness of natural resource conservation and sustainability.
- Understand wildlife conservation and biodiversity management strategies.
- Apply ecological knowledge to address environmental problems.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				**Evaluation Scheme (Marks)**				
				Theory (Marks)		**Practical (Marks)**		
Lecture (L)	**Tutorial (T)**	**Practical (P)**	**Credit**	**University Assessment**	**Continuous Assessment**	**University Assessment**	**Continuous Assessment**	**Total (Marks)**
3	-	2	4	50	25	--	25	100

Subject Contents:

Unit	Content	Lectures	Weightage
1	**Fundamentals of Ecology and Ecosystem Functioning** Definition, scope, and branches of ecology Levels of organization: organism → population → community → ecosystem → biosphere Abiotic factors: light, temperature, water, soil Biotic interactions: mutualism, commensalism, parasitism, predation, competition Ecosystem structure and function Energy flow in ecosystems (food chains, food webs, ecological pyramids) Biogeochemical cycles: water, carbon, nitrogen, phosphorus	15	33%
2	**Population, Community Ecology and Biodiversity** Population characteristics: density, natality, mortality, dispersion Population growth models: exponential and logistic growth Carrying capacity and population regulation Community structure and ecological succession (primary and secondary) Ecological niche and species interactions Biodiversity: types (genetic, species, ecosystem) and importance	15	33%

3	**Environmental Conservation and Applied Ecology** Environmental pollution: air, water, soil, noise, radioactive—sources, effects, control. Global environmental issues: climate change, global warming, ozone depletion, acid rain. Conservation of natural resources: water, forest, soil, minerals Sustainable development and environmental management Wildlife conservation: biodiversity hotspots, endangered species, causes of depletion Conservation strategies: in-situ and ex-situ methods Protected areas: national parks, wildlife sanctuaries, biosphere reserves Human-wildlife conflict and conservation policies (India) Role of community participation and NGOs	15	34%

List of Experiments:

- Soil Analysis for Conservation
- Composting Experiment
- Rainwater Harvesting Model (Demonstration)
- Quadrat Method for Vegetation Analysis
- Carbon Footprint Estimation (Basic) with examples only
- Visit to protected area and its case study.

Textbooks:

- Sharma, P. D. (2017). Ecology and Environment (13th ed.). Rastogi Publications.

Reference Books:

- Atlas and Bartha, Microbial Ecology
- Bharucha, E. (2013). Textbook of Environmental Studies for Undergraduate Courses. Universities Press.
- Agarwal, K. C. (2010). Environmental Biology. Nidi Publishers.
- Sharma, P. D. (2017). Ecology and Environment (13th ed.). Rastogi Publications.
- Rajagopalan, R. (2016). Environmental Studies: From Crisis to Cure (3rd ed.). Oxford University Press India
- Odum, E. P., & Barrett, G. W. (2005). Fundamentals of Ecology (5th ed.). Brooks/Cole.
- Krebs, C. J. (2016). Ecology: The Experimental Analysis of Distribution and Abundance (6th ed.). Pearson.
- Begon, M., Townsend, C. R., & Harper, J. L. (2006). Ecology: From Individuals to Ecosystems (4th ed.). Blackwell Publishing.
- Cunningham, W. P., & Cunningham, M. A. (2019). Environmental Science: A Global Concern (15th ed.). McGraw-Hill.

List of Open-Source Software/learning website:

- https://www.youtube.com/watch?v=GlnFylwdYH4
- https://www.khanacademy.org/science/biology/ecology/intro-to-ecology/v/ecologyintroduction

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Define and explain fundamental ecological concepts, including ecosystem structure, energy flow, biogeochemical cycles, and ecological interactions.	1 Remember 2 Understand
CLO2	Explain, apply, and analyze population and community dynamics, including growth patterns, ecological succession, biodiversity, and species interactions.	2 Understand 3 Apply 4 Analyse
CLO3	Explain, apply, analyze, and evaluate the causes, impacts, and control measures of environmental pollution and global ecological issues such as climate change and resource depletion.	2 Understand 3Apply 4 Analyse 5 Evaluate
CLO4	Apply, analyze, and evaluate principles of natural resource conservation and sustainable development in real-world environmental contexts.	3Apply 4 Analyse 5 Evaluate
CLO5	Explain, apply, analyze, and evaluate wildlife conservation strategies, including biodiversity protection, habitat management, and conservation policies at national and global levels.	2 Understand 3Apply 4 Analyse 5 Evaluate
CLO6	Apply, analyze, evaluate, and design ecological conservation strategies by integrating scientific knowledge, environmental policies, and community-based approaches to address current environmental challenges.	3Apply 4 Analyse 5 Evaluate 6 Create

Mapping of CLO s with POs & PSOs

Course Learning Outcomes	Programme Outcomes (POs)																Programme Specific Outcome (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	PSO1	PSO2	PSO3
CLO1	1	2			2	1								2				1	2
CLO2	1	2			2	2								2	2				3
CLO3	3	2			2	3							2	3	2	2	1		3
CLO4	3	2			2	3							2	3	2	2			3
CLO5	3	2			2	3			1			1	2	3	2	2		1	3
CLO6	3	2	3		2	3	1		2		1	1	2	3	2	2		3	2

3: High, 2: Medium, 1: Low

Faculty of Science and Humanities
B.Sc. (Biotechnology) (Semester - 7)
In Effect from Academic Year 2023-24

Branch Name:	B.Sc. Biotechnology
Program Code:	SC101
Course Name:	Environment Impact Assessment for Environmental Health
Course Code:	17-MIE401-4O
Pre-requisite Course:	

Course Objectives:

- To introduce the fundamental concepts and significance of Environmental Impact Assessment (EIA) in developmental and industrial activities.
- To understand the systematic process and steps involved in EIA, including screening, scoping, impact prediction, evaluation, and mitigation.
- To develop the ability to assess environmental impacts (physical, chemical, biological, social, and economic) of proposed projects.
- To highlight the importance of high-quality EIA practices for predicting future environmental consequences and implementing mitigation strategies.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				**Evaluation Scheme (Marks)**				
				Theory (Marks)		**Practical (Marks)**		
Lecture (L)	**Tutorial (T)**	**Practical (P)**	**Credit**	**University Assessment**	**Continuous Assessment**	**University Assessment**	**Continuous Assessment**	**Total (Marks)**
3	-	2	4	50	25	--	25	100

Subject Contents:

Unit	Content	Lectures	Weightage
1	Introduction to Environment Management & EIA Legal, Policy & Regulatory Framework EIA Procedure - Scoping & Screening and Establishing Baseline Conditions EIA Methodologies	15	33%
2	Connectedness: connected spaces and subspaces, Connectedness of the real line, Intermediate value theorem EIA Methods, Tools and Techniques Public Involvement in EIA	15	33%
3	Impact Management - Mitigation & Preparation of Environment Management Plans (EMP) EIA Reporting & Review of EIA Quality Decision Making & Project Management Implementation & Follow up EIA Case Examples	15	34%

List of Experiments:

1. Identification of Environmental Components
2. Study a nearby area (campus/village/industry surroundings)
3. Identify physical, biological, and socio-economic components
4. Prepare a checklist and environmental description report
5. Review a simple EIA case (road, small industry)
6. Study of EIA Notification (India)-Analyze EIA Notification 2006

Textbooks: Wathern P., "Environmental Impact Assessment: Theory and Practice",Routledge Publishers,1990

Reference Books:

- Marriott B., "Environmental Impact Assessment: A Practical Guide",McGraw-Hill Publication,1997
- Shrivastava A.K., Baxter Nicola, Grimm Jacob, "Environmental Impact Assessment", APH Publishers, 2003
- Anjaneyulu Y., Manickam Valli, "Environmental Impact Assessment Methodologies", CRC Press 2011
- Glasson J., Therivel Riki, Chadwick Andrew, "Introduction to Environmental Impact Assessment", Oxford Brookes University 2012/ 4th edition

List of Open-Source Software/learning website:

https://onlinecourses.nptel.ac.in/noc26_ar13/preview

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Understand fundamental concepts and significance of EIA. Explain steps involved in EIA (screening, scoping, prediction, mitigation).	1 Remember 2 Understand
CLO2	Apply EIA methodologies to assess environmental impacts.	3Apply
CLO3	Analyze environmental components (physical, biological, socio-economic). Assess sustainability issues in water resource development.	4 Analyse
CLO4	Evaluate impacts of air pollution on health and environment.	5 Evaluate
CLO5	Assess sustainability issues in water resource development	5 Evaluate
CLO6	Assess sustainability issues in water resource development	6 Create

Mapping of CLO s with POs & PSOs

Course Learning Outcomes	Programme Outcomes (POs)																Programme Specific Outcome (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	PSO1	PSO2	PSO3
CLO1	2	2	1		2	1												1	2
CLO2	2	2	2		1	2									2				
CLO3	2	2	3		2	3							2			2	1		
CLO4	2	2			3	3							2	3		2			
CLO5	3	2			2	3			1			1	2	3	2	2		1	3
CLO6	3	2	3		2	3	1		2		1	1	2	3	2	2		3	2

3: High, 2: Medium, 1: Low