

Bhakta Kavi Narsinh Mehta University Junagadh



FACULTY OF LIFE SCIENCE

SYLLABUS FOR BACHELOR OF SCIENCE (HONOURS)

PROGRAMME MICROBIOLOGY (SEMESTER – 7)

(w.e.f. June– 2026)

BHAKTA KAVI NARSINH MEHTA UNIVERSITY
Syllabus of B.Sc. (Honors) as per NEP-2020
Faculty of Life Sciences
Effective from June 2026
Subject: Microbiology
SEMESTER- VII

SUMMARY OF THE SYLLABUS

Sem No.	Sr. No.	Category of Course	Course Title	Course Level	Credit	Teaching Hrs.	SEE Marks	CCE Marks	Total Marks	Exam Duration
Sem-7	1	Major-17	Biochemistry and Molecular Biology	6.0	4	60	50	50	100	2 hrs.
	2	Major-18	Biotechnology and Immunology	6.0	4	60	50	50	100	2 hrs.
	3	Major-19	Combine Practical	6.0	4	120	50	50	100	4 hrs.
	4	Minor-7	Ecology and Climate Change	6.0	4 (3T + 1P)	75 (45T + 30P)	50	50	100	4 hrs.
	5	*OJT/Major, SEC	-	6.0	6	-	75	75	150	6 hrs.
				Total	22		275	275	550	

*Select **On Job Training (OJT)** as per the NEP 2020, BKNMU guideline.

OR

Select **One Major + SEC** as per the Basket provided with syllabus.

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Course Level	6.0	Internal Marks	50
Programme	B.Sc. Microbiology	External Marks	50
Semester	VII	Practical Internal	-
Category of Course	MAJOR-17	Practical External	-
Course Credit	04	Prac. External Exam Duration	-
Teaching Hours	60	Total	100
Course Code	MAJMBT701	Exam Duration	2 hrs.
Course Title	Biochemistry and Molecular Biology (Theory)		

Course Objectives:

1. Understand the classification, mechanism of action, regulation, and biological significance of enzymes, and analyze factors affecting enzyme activity through enzyme kinetics.
2. Explain the molecular organization of genes and genomes, including gene structure, regulation of gene expression, and mechanisms controlling transcription and translation in prokaryotic and eukaryotic systems.
3. To understand gene mutations, chromosomal variations, and their biological significance.

Course Learning Outcomes: After completion of the course:

1. Analyze enzyme kinetic parameters and evaluate factors influencing enzyme-catalyzed reactions.
2. Examine the organization of genes and genomes, and describe the molecular mechanisms governing gene expression in prokaryotes and eukaryotes.
3. Assess the impact of mutations, chromosomal abnormalities, and defects in DNA repair pathways.

Course Contents

Sem	Unit No.	Syllabi	Teaching Hours
7	1	Advanced Metabolic Biochemistry • Macronutrients and micronutrients: vitamins, and major minerals; their roles in enzyme function, nerve conduction, and oxygen transport.	15

		• Photosynthesis: light reactions, photophosphorylation, electron transport, and Calvin cycle. • Biosynthesis and functions of plant secondary metabolites: alkaloids, flavonoids, terpenoids; ecological and medicinal roles. • Bioenergetics: ΔG, ATP as energy currency, high-energy phosphate compounds (e.g., phosphoenolpyruvate, 1,3-bisphosphoglycerate, creatine phosphate).	
	2	Enzymes and enzyme kinetics • Enzyme nomenclature, active site, cofactors, coenzymes, and isoenzymes. • Michaelis–Menten kinetics, Lineweaver–Burk plots, and kinetic parameters (K_m, V_{max}); inhibition types: competitive, non-competitive, uncompetitive, and mixed inhibition. • Allosteric regulation, feedback inhibition, and cooperativity (e.g., hemoglobin and aspartate transcarbamoylase). • Microbial enzyme production and industrial applications: amylases, proteases, lipases, cellulases, and pectinases. • Recombinant microbial systems for production of human proteins (e.g., insulin, growth hormone) using bacteria and yeast.	15
	3	Gene Structure and Expression • Concept of Gene: classical to molecular definition, fine structure of gene (cistron–recon–muton), gene organization, split genes, gene families, pseudogenes, overlapping genes, and transposable elements. • Gene expression I: genetic code and its properties, transcription in prokaryotes and eukaryotes, RNA polymerases, transcription factors, and RNA processing (capping, splicing, polyadenylation, RNA editing and transport). • Gene expression II: translation in prokaryotes and eukaryotes, ribosome structure and function, genetic code interpretation, translational regulation, protein folding, targeting, and post-translational modifications. • Regulation of gene expression: operon models in prokaryotes, transcriptional regulation in prokaryotes and eukaryotes, epigenetic regulation, RNA-mediated regulation, chromatin remodeling, and gene regulatory networks.	15

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	4	Mutation, Chromosomal Variation, DNA Repair, and Cytoplasmic Inheritance • Molecular basis of mutations: spontaneous and induced mutations, types of gene mutations, mutagenic agents, mechanisms of mutagenesis, and effects on gene function. • Structural and numerical chromosomal aberrations: mechanisms, causes, and genetic consequences. • DNA damage: sources, types, and molecular mechanisms of DNA repair systems in prokaryotes and eukaryotes. • Cytoplasmic inheritance: mitochondrial and chloroplast genomes, maternal inheritance, and non-Mendelian inheritance patterns.	15
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Suggested Reading:

1. The physiology and Biochemistry of Prokaryotes, 2nd edition By. David white
2. Outlines of biochemistry By- Conn E.E. and Stumpt P.K.: 4th Ed
3. General microbiology by Stanier R.Y.: 5th Ed.
4. Principles of Biochemistry By Lehninger
5. General microbiology by Powar and Dagainawala Vol-1
6. Molecular Biology of the Gene
7. Molecular Biology of the Cell
8. Lewin's Genes
9. Molecular Cell Biology

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Course Level	6.0	Internal Marks	50
Programme	B.Sc. Microbiology	External Marks	50
Semester	VII	Practical Internal	-
Category of Course	MAJOR-18	Practical External	-
Course Credit	04	Prac. External Exam Duration	-
Teaching Hours	60	Total	100
Course Code	MAJMBT702	Exam Duration	2 hrs.
Course Title	Biotechnology and Immunology (Theory)		

Course Objectives:

1. Introduce the concepts, tools, and methodologies of recombinant DNA technology and genetic engineering used in modern biotechnology.
2. Develop knowledge of gene cloning, vector systems, gene transfer methods, and molecular techniques employed in biotechnology research and product development.
3. Explain the structure and functions of the immune system, mechanisms of innate and adaptive immunity, and antigen-antibody interactions.

Course Learning Outcomes: After completion of the course:

1. Student learned the principles and methodologies of recombinant DNA technology, including cloning vectors, restriction enzymes, ligases, and gene transfer techniques.
2. Describe the principles, media requirements, and techniques used in plant and animal tissue culture.
3. Understand the organization and functions of the immune system, including innate and adaptive immune responses..

Course Contents

Sem	Unit No.	Syllabi	Teaching Hours
6	1	Basics of Biotechnology and Recombinant Technology • Biotechnology: definition, scope, historical development, and applications; enzyme and cell immobilization techniques and their industrial applications. • Principles of bioremediation, fundamentals of genetic engineering, and techniques for nucleic acid isolation and purification.	15

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		• Restriction endonucleases, molecular scissors in DNA manipulation, and gene targeting strategies for genome modification. • Molecular cloning vectors: plasmids (pBR322, pUC series), bacteriophages (λ phage), cosmids, and host–vector systems for gene cloning and expression (YACs).	
	2	Animal and Plant Tissue Culture • Fundamental principles of plant tissue culture, aseptic techniques, and culture environment optimization. • Types of Plant Tissue Culture: Callus culture, Cell suspension, Meristem, Shoot tip, Anther/pollen, Embryo culture, Protoplast culture and fusion. • Basic Steps of Plant Tissue Culture • Animal cell culture principles, techniques (Aseptic handling techniques, Cell counting, Cell viability test, Sub-culturing, Cryopreservation of animal cells) and applications in biotechnology.	15
	3	Immunology-I • Antigen Antibody: Factors Influencing Immunogenicity, Structure of Ig, Ig Classes & Biological Activities, Monoclonal Antibodies, Polyclonal antibody • Innate and Adaptive Immune System • Antigen-Antibody Interactions: ELISA Test, Agglutination, Precipitation, Immunofluorescence, Radioimmunoassay	15
	4	Immunology-II • Immunodeficiency diseases • Hypersensitivity • Autoimmune diseases • Autoinflammatory disorders	15

Suggested Reading:

1. Immunology – 5th edition – J.Kuby, R. A. Goldsby , T.J.Kindt B.A. Osborne – W.H. Freeman and Company , New York
2. Principles of Microbiology- 2nd edition – R.M.Atlas – Wm.C.Brown Publishers
3. Microbiology – 5th edition – Prescott , Harley , Klein – McGrawHill Publishers
4. Instant Notes in Microbiology – P.M. Lyolyard , A. Whelan, M.W. Fanger
5. Immunology – Raj Khanna – Oxford University Press

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Course Level	6.0	Internal Marks	-
Programme	B.Sc. Microbiology	External Marks	-
Semester	VII	Practical Internal	50
Category of Course	MAJOR-16	Practical External	50
Course Credit	04	Prac. External Exam Duration	4 hrs.
Teaching Hours	120	Total	100
Course Code	MAJMBP703	Exam Duration	-
Course Title	Combined practical (Practical)		

Course Objectives:

1. Apply biochemical and molecular biological concepts to interpret experimental data, analyze genetic phenomena, and solve problems related to metabolism, heredity, and genome function.
2. Enable students to apply biotechnological and immunological principles to solve problems in healthcare, agriculture, industry, and research.

Course Learning Outcomes: After completion of the course:

1. Analyze enzyme kinetic parameters and evaluate factors influencing enzyme-catalyzed reactions.
2. Evaluate the applications of biotechnology and immunology in medicine, agriculture, environmental management, and industrial production..
3. Apply the immunological methods in diagnostics and research.

Course Contents

Sem	No.	Syllabi	Teaching Hours
6	1	Estimation of sugar by DNSA method	120
	2	.Extraction and estimation of protein by Folin-Lowry method	
	3	To determine the saponification value of fats and oils	
	4	Perform the qualitative test of plant secondary metabolites	
	5	Perform the amylase activity	
	6	Determination of Vmax and Km for the amylase enzyme by performing a substrate curve with a Lineweaver-Burk plot.	
	7	Determination of Vmax and Km for phosphatase by performing a substrate curve with the Lineweaver-Burk plot	

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	8	Preparation of plant tissue culture media	
	9	Perform the surface sterilization of explants	
	10	Preparation of animal cell culture media	
	11	Quantitative estimation of DNA by the diphenylamine method	
	12	Quantitative estimation of RNA by orcinol method	
	13	Dot ELISA	
	14	Direct ELISA Technique	
	15	Indirect ELISA Technique	
	16	To perform the Ouchterlony double diffusion.	
	17	To perform the technique of radial immunodiffusion	
	18	To learn the technique of agglutination.	

Suggested Reading:

1. Patel. R.J., Patel. K.R., Experimental Microbiology, Vol-I, Aditya Publications, Ahmedabad, India.
2. Patel. R.J., Patel. K.R., Experimental Microbiology, Vol-II, Aditya Publications, Ahmedabad, India.
3. Dubey. R.C., Maheshwari. D.K., Practical Microbiology, S.Chand & Company Ltd., New Delhi
4. Konika Sharma., manual of Microbiology – Tools & Techniques, Ane Books, Delhi.
5. Medical Laboratory Technology – Vol – I , II , III – Mukherji K.L.
6. A Text Book in Medical Laboratory Technology – P.B.Godkar

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Course Level	6.0	Internal Marks	25
Programme	B.Sc. Microbiology	External Marks	50
Semester	VII	Practical Internal	25
Category of Course	MINOR-7	Practical External	-
Course Credit	04 (03T+01P)	Prac. External Exam Duration	-
Teaching Hours	75 (45T+30P)	Total	100
Course Code	MINMBT701	Exam Duration	2 Hrs.
Course Title	Ecology and Climate Change (Theory)		

Course Objectives:

1. Provide students with an understanding of population and community ecology, including ecological organization, species interactions, community structure, and ecological succession.
2. Develop knowledge of ecosystem functioning through productivity, biogeochemical cycles, ecosystem services, resilience, and sustainable management practices.
3. Familiarize students with the Earth's climate system, causes of climate change, climate indicators, and scientific approaches to climate monitoring.

Course Learning Outcomes: After completion of the course:

1. Analyze population characteristics, species interactions, community organization, and ecological succession in natural ecosystems.
2. Evaluate ecosystem productivity, nutrient cycling, ecosystem services, and approaches for ecosystem restoration and sustainability..
3. Interpret climate system processes, assess causes and evidence of climate change, and apply climate monitoring concepts..

Course Contents

Sem	Unit No.	Syllabi	Teaching Hours
7	1	Population and Community Ecology • Ecological Foundations: Levels of ecological organization; habitat, ecological niche and ecological adaptations; Gause's principle of competitive exclusion and resource partitioning • Population Ecology: Population characteristics and growth patterns; carrying capacity and population regulation	12

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		- Population Interactions: Competition, predation, parasitism, mutualism and commensalism - Community Ecology: Community structure and organization; species diversity, richness and evenness; ecotone and edge effect - Ecological Succession: Types and processes; climax concept	
	2	Ecosystem Ecology - Ecosystem Productivity: Primary and secondary productivity; factors affecting productivity - Biogeochemical Cycles: Carbon, nitrogen, phosphorus and hydrological cycles - Ecosystem Services: Provisioning, regulating, supporting and cultural services - Ecosystem Resilience and Sustainability: Ecosystem resilience; ecological restoration; sustainable ecosystem management	11
	3	Climate Change and Earth System Processes - Climate System and Basics: Weather and climate; atmospheric structure; solar radiation; Earth's heat budget; greenhouse effect - Causes of Climate Change: Natural climate variability; human activities; greenhouse gases; land-use change and deforestation - Evidence of Climate Change: Global warming; glacier retreat; sea-level rise; ocean acidification; extreme weather events - Climate Monitoring: Climate indicators; basic ideas of climate monitoring and modelling; carbon footprint and ecological footprint	10
	4	Climate Change Impacts, Responses and Governance - Impacts of Climate Change: Effects on terrestrial, freshwater, coastal and marine ecosystems; species distribution shifts; phenology - Climate Change Mitigation: Carbon cycle; carbon sequestration; carbon budgeting; renewable energy; nature-based solutions - Climate Change Adaptation: Climate-smart agriculture; ecosystem-based adaptation; water resource management; disaster risk reduction - Climate Governance (India and Global Context): Overview of UNFCCC and Paris Agreement; India's climate policy framework with special reference to NAPCC and regulatory role of National Green Tribunal (NGT); climate resilience and community participation	12

Suggested Reading:

1. Fundamentals of Ecology by Eugene P. Odum and Gary W. Barrett.

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2. Ecology: From Individuals to Ecosystems by Michael Begon, Colin R. Townsend and John L. Harper.
3. Elements of Ecology by Thomas M. Smith and Robert L. Smith.
4. Ecology by Michael L. Cain, William D. Bowman and Sally D. Hacker.
5. Ecological Methodology by Charles J. Krebs.
6. A Primer of Ecology by Nicholas J. Gotelli.
7. Community Ecology by Peter J. Morin.
8. The Economy of Nature by Robert E. Ricklefs and Rick Relyea.
9. Environmental Biology by P. D. Sharma.
10. Introduction to Modern Climate Change by Andrew E. Dessler.
11. Climate Change: The Science of Global Warming and Our Energy Future by Edmond A. Mathez and Jason E. Smerdon.
12. Climate Change Biology by Lee Hannah.
13. Principles of Environmental Science by William P. Cunningham and Mary Ann Cunningham.
14. Environmental Science: Earth as a Living Planet by Daniel B. Botkin and Edward A. Keller. P. J. Quinn, B. K. Markey, F. C. Leonard, P. Hartigan, S. Fanning, E. S. Fitzpatrick. Veterinary Microbiology and Microbial Disease. Wiley-Blackwell (2011).

Suggested Practical Course (Minor-7)

Sem	No.	Syllabi	Teaching Hours
7	1	Ecological Sampling and Vegetation Analysis: Study of vegetation using quadrat methods for determination of frequency, density, abundance and Importance Value Index (IVI).	30
	2	Biodiversity Assessment: Assessment of species richness, diversity and evenness using Shannon-Wiener and Simpson's diversity indices.	
	3	Community Structure Analysis: Study of community composition, dominance and species associations in selected ecosystems.	
	4	Determination of population characteristics including density, dispersion patterns and growth patterns using field data.	

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5	Determination of primary productivity using light and dark bottle method or suitable ecosystem models.
6	Construction and analysis of food chains, food webs and ecological pyramids from field observations.
7	Estimation of above-ground biomass and carbon sequestration potential of selected plant communities.
8	Analysis of long-term climatic data (temperature, rainfall, humidity and CO ₂ concentration) using IMD datasets.
9	Assessment of ecological vulnerability of selected ecosystems using standard indicators.
10	Preparation of biodiversity inventory of a selected ecosystem using field survey methods.
11	Calculation of individual, household or institutional carbon footprint.
12	Field visit to a protected area, wetland, coastal ecosystem, forest ecosystem or biodiversity hotspot and submission of a field report.

Suggested Reading:

1. Environmental and Ecology by P. D. Sharma..
2. Fundamentals of Ecology by Eugene P. Odum and Gary W. Barrett..
3. Elements of Ecology by Thomas M. Smith and Robert L. Smith.

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Subject: Microbiology**SEMESTER- VII****Theory Paper Style:
(Major and Minor)****Time: 2 Hours****Total Marks: 50****Instructions:**

1. Illustrate your answer with neat and labelled diagrams.
2. Figure to the right side indicates full marks of questions.

EXTERNAL ASSESSMENT BY UNIVERSITY			
Que. No.	Particulars	Unit	Marks
Que. 1	(1)	Unit 1	05
	(2)		05
	Or		
	(1)		05
	(2)		05
Que. 2	(1)	Unit 2	05
	(2)		05
	Or		
	(1)		05
	(2)		05
Que. 3	(1)	Unit 3	05
	(2)		05
	Or		
	(1)		05
	(2)		05
Que. 4	(1)	Unit 4	05
	(2)		05
	Or		
	(1)		05
	(2)		05
Que. 5	(1)	Unit 1 & 2	05
	(2)		05
	Or		
	(1)	Unit 3 & 4	05
	(2)		05
Total			50

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INTERNAL EVALUATION SCHEME (MAJOR)			
INTERNAL ASSESSMENT			
No.	Particulars	Marks	Weightage
1	Internal Test	50	25
2	Assignment		10
3	Field visit report/ class presentation		10
4	Attendance		05
	Total		50

INTERNAL EVALUATION SCHEME (MINOR)			
INTERNAL ASSESSMENT			
No.	Particulars	Marks	Weightage
1	Internal Practical	50	25
2	Internal Test		10
3	Field visit report/ class presentation		10
4	Attendance		05
	Total		50

INTERNAL EVALUATION SCHEME		
INTERNAL ASSESSMENT		
No.	Particulars	Weightage
1	Practical Performance	40
2	Viva	10
	Total	50

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Paper Style:

INTERNAL EVALUATION SCHEME		
INTERNAL ASSESSMENT PRACTICAL		
No.	Particulars	Weightage
1	Perform any Four practical from the given list of exercises as per the instruction of the examiner.	40
2	Viva	10
Total		50

ASSESSMENT BY UNIVERSITY		
Que. No.	Particulars	Marks
EXTERNAL EXAMINER		
1	Perform any Three or Four practical from the given list of exercises as per the instruction of the examiner	40
2	Viva-voce	10
Total		50

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Course Level	6.0	Internal Marks	50
Programme	B.Sc. Microbiology	External Marks	50
Semester	VII	Practical Internal	-
Category of Course	OJT/MAJOR	Practical External	-
Course Credit	04 (3+1)	Prac. External Exam Duration	-
Teaching Hours	75 (45T+30P)	Total	100
Course Code	MAJMBT703 (OJT)	Exam Duration	2 hrs.
Course Title	Biostatistics, Research Methodology and AI (Theory)		

Course Objectives:

4. To introduce statistical concepts and analytical tools used in biological research.
5. To develop skills in research design, data collection, hypothesis formulation, and scientific writing.
6. To familiarize students with emerging applications of Artificial Intelligence and Machine Learning in biological sciences.

Course Learning Outcomes: After completion of the course:

4. Apply statistical methods for analysis and interpretation of biological data and design scientific research projects using appropriate methodologies and ethical practices.
5. Use statistical software and AI-based tools for data analysis and problem-solving .
6. Explain the applications of Artificial Intelligence and Machine Learning in agriculture, plant sciences, biodiversity studies, and environmental monitoring.

Course Contents

Sem	Unit No.	Syllabi	Teaching Hours
7	1	Basics and Concepts of Biostatistics • Data classification, Frequency distribution and Graphs. • Measure of Central Tendency: Meaning, Objectives, Merits, Demerits & Uses. • Measure of Dispersion – Range, Variance, Standard deviation, Coefficient of Variation; Confidence limit and confidence interval. • Probability distributions (Binomial, Poisson and normal), Sampling distribution; Difference between parametric and	15

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		non-parametric statistics; Confidence Interval; Errors; Levels of significance.	
	2	Statistical tests in Biology - Regression and Correlation analysis. - Student's t-test: Paired and Unpaired. - Level of Significance & Degree of Freedom: Chi-square test (X²); Analysis of Variance (ANOVA) - Basics of Multivariate statistics.	15
	3	Basic Research Methodology - Research problem, Aims & Objectives, types of scientific research - Hypothesis formulation and testing, Literature survey and review, and Mentoring - Sampling techniques, optimization of protocol, graphical data analysis, data validation - Plagiarism, Referencing tools	15
	4	Artificial intelligence foundation - Introduction to Artificial Intelligence, AI fundamentals, Use-cases and applications of AI, Issues concerning AI in business, ethics and bias, jobs and scope. - Brief history of AI and ML in Healthcare and biology, Machine Learning workflow and terminologies, computational models of intelligence. - Applications of AI in genomics, bioinformatics, disease diagnosis, drug discovery and biological data analysis.	15

Suggested Reading:

1. Introduction to Bio-Statistics, Banerjee Pranab Kumar, S Chand & Company
2. Biostatistics, Veer Bala Rastogi, Medtech
3. Biostatistics Analysis, Zar, Pearson
4. Biostatistics for health and life sciences, Rao K Surya, Himalaya Publishing house
5. An Introduction to Biostatistics, Gurumani
6. Research methodology, C R Kothari, New Age Publishers
7. Principles of Biostatistics by Marcello Pagano, Duxbury Thomson Learning
8. Russell, Norvig, Artificial Intelligence: A Modern Approach, Third edition, Prentice Hall, 2010
9. Artificial Intelligence in Healthcare
10. Foundations of Artificial Intelligence in Healthcare and Bioscience

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Suggested Practical course (OJT/Major)

Sem	No.	Syllabi	Teaching Hours
7	1	Frequency Distribution.	30
	2	Standard Deviation and Coefficient of Variation	
	3	Confidence limits for the population mean.	
	4	Students 't' test.	
	5	Analysis of Variance.	
	6	Regression and Correlation	
	7	Chi Square Test	
	8	Research proposal preparation.	
	9	Multivariate tools and its application	
	10	Data validation using statistical tools	
	11	Graphical data analysis	
	12	Introduction to AI tools for biological data Analysis	
	13	Uses of ChatGPT/Gemini/AI tools in scientific literature search	

Suggested Reading:

1. An Introduction to Biostatistics, Gurumani
2. Research methodology, C R Kothari, New Age Publishers
3. Foundations of Artificial Intelligence in Healthcare and Bioscience

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Programme	B.Sc (Honours)	External Marks	25
Semester	VII	Practical Internal	-
Category of Course	Skill Enhancement Course-5	Practical External	-
Course Credit	01	Prac. External Exam Duration	-
Teaching Hours	30	Total	25
Course Code	SECMBT701	Exam Duration	1 Hrs.
Course Title	Good Laboratory Practice and Biosafety (Theory)		

Course Objectives: By completing the course, students have to:

- Understand the principles, history, regulatory requirements, and significance of Good Laboratory Practices (GLP) in microbiological research, diagnostics, and industrial laboratories.
- Develop competency in laboratory organization, documentation, standard operating procedures (SOPs), and quality management systems essential for laboratory operations.
- Apply biosafety and biosecurity principles to identify, assess, and manage biological, chemical, and physical hazards in microbiology laboratories.

Course Learning Outcomes: After completion of the course:

- Explain the concepts, principles, and regulatory framework of GLP, biosafety, and laboratory quality management systems.
- Describe laboratory biosafety levels (BSL-1 to BSL-4), risk assessment procedures, containment measures, and waste disposal practices.
- Prepare, implement, and maintain laboratory documentation, SOPs, equipment records, and quality assurance records..

Course Content

Sem	Unit No.	Syllabus	Teaching Hours
3	1	Introduction to GLP • Principles and objectives of GLP; OECD and WHO guidelines. • Laboratory design and layout, Roles and responsibilities of laboratory personnel, Laboratory management structure	8

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		Preparation and implementation of SOPs, Documentation practices, Record keeping and data integrity	
	2	Sample and Data Management - Sample collection, labeling, transport, and storage, Specimen processing and preservation, Contamination control. - Good Documentation Practices (GDP), Electronic data management, Data integrity principles, Study reports. - Sterility testing, Environmental monitoring, Culture collection management, Quality control of media and reagents	8
	3	Basics of Biosafety - Biosafety fundamentals: Introduction; Historical Background; Introduction to Biological Safety Cabinets; Primary Containment for Biohazards; Biosafety Levels - Biosafety Levels of Specific Microorganisms; Recommended Biosafety Levels for Infectious Agents and Infected Animals.	7
	4	Biosafety Regulation - Biosafety regulation: Biosafety guidelines-Government of India; Definition of GMOs & LMOs. - Roles of Institutional Biosafety Committee, RCGM, GEAC etc. for GMO applications in food and agriculture. - Environmental release of GMOs; Risk Analysis; Risk Assessment; Risk management and communication.	7

Suggested Reading:

1. Handbook: Good Laboratory Practice Published by the World Health Organization.
2. OECD Principles on Good Laboratory Practice,
3. Handbook: Laboratory Quality Management System, Published by the World Health Organization
4. Mackie and McCartney Practical Medical Microbiology
5. Training Manual: Good Laboratory Practice, WHO
6. Bioethics and Biosafety M.K. Sateesh, I K International Publishing House
7. Biosafety and Regulation for Genetically Modified Organisms, Xue, Ipha Science International Ltd
8. Department of Biotechnology, Biosafety Manual
9. PR, Biosafety and Bioethics, Goel and Parashar, Person

BHAKTA KAVI NARSINH MEHTA UNIVERSITY
Syllabus of B.Sc. (Honors) as per NEP-2020
Faculty of Life Sciences
Effective from June 2026
Subject: Microbiology
SEMESTER- VII

Course Level	UG	Internal Marks	25
Programme	B.Sc. Microbiology	External Marks	-
Semester	VII	Practical Internal	-
Category of Course	SEC-5	Practical External	-
Course Credit	01	Prac. External Exam Duration	1 Hrs.
Teaching Hours	-	Total	25
Course Code	SECMBP701	Exam Duration	-
Course Title	Good Laboratory Practice and Biosafety (Practical)		

Course Objectives:

1. Demonstrate safe laboratory practices and biosafety procedures.
2. Prepare and maintain laboratory documentation and SOPs.
3. Conduct risk assessment and implement biosafety measures.

Course Learning Outcomes: After completion of the course:

1. Prepare and maintain laboratory documentation, SOPs, logbooks, and quality records..
2. Perform sterilization validation, specimen labeling, preservation, and environmental monitoring procedures.
3. Conduct laboratory risk assessments and implement biosafety measures.

Suggested Practical

Sr. No	Practical content	Teaching Hrs
1.	Laboratory Orientation and GLP Compliance Assessment • Familiarization with laboratory layout • Identification of GLP-compliant practices • Laboratory inspection checklist preparation	30
2.	Preparation of Standard Operating Procedures (SOPs). • Drafting SOP for media preparation • Drafting SOP for aseptic transfer of cultures	
3.	Good Documentation Practices. • Laboratory notebook maintenance • Recording observations and deviations • Preparation of equipment logbooks	
4.	Validation of Autoclave Sterilization • Use of biological indicators • Use of chemical indicators • Interpretation of sterilization results	

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5.	Risk Assessment Exercise • Hazard identification • Risk categorization • Risk assessment documentation	
6.	Preparation and Evaluation of Disinfectants.	
7.	Surface and Workspace Decontamination Procedures. • Cleaning protocols • Monitoring effectiveness of decontamination	
8.	Sample Collection, Labeling, and Chain-of-Custody Documentation • Specimen labeling • Sample tracking forms • Storage records	

Suggested reading

1. Patel. R.J., Patel. K.R., Experimental Microbiology, Vol-I, Aditya Publications, Ahmedabad, India.
2. Patel. R.J., Patel. K.R., Experimental Microbiology, Vol-II, Aditya Publications, Ahmedabad, India.
3. Dubey. R.C., Maheshwari. D.K., Practical Microbiology, S.Chand & Company Ltd., New Delhi

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INTERNAL EVALUATION SCHEME		
INTERNAL ASSESSMENT		
No.	Particulars	Weightage
1	Internal test (Theory or practical)	13
2	Assignment/practical assignment	5
3	Field visit report/ class presentation	5
4	Attendance	2
	Total	25

Paper Style:

Ques. No.	Particulars	From which Unit	Marks
Que.1	Question 1 (1) (2)	1 & 2	05 05
	Or		
	Question 1 (1) (2)		05 05
Que.2	Question 2 (1) (2)	3 & 4	05 05
	Or		
	Question 2 (1) (2)		05 05
Que.3	Question 1	From Any Unit	05
	Or		
	Question 2		
Total		25	