

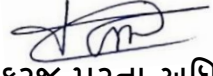


પરિપત્ર:

ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટીની લાઈફ સાયન્સ વિદ્યાશાખાનાં અભ્યાસક્રમ ચલાવતી તમામ સંલગ્ન કોલેજોનાં આચાર્યશ્રીઓને સવિનય જણાવવાનું કે લાઈફ સાયન્સ વિદ્યાશાખા હેઠળનો NEP-૨૦૨૦ અંતર્ગત માઇક્રોબાયોલોજી વિષય સેમેસ્ટર-૬નો અભ્યાસક્રમ આ સાથે સામેલ છે.

માનનીય કુલપતિશ્રીની મંજૂરી અનુસાર સદર અભ્યાસક્રમ શૈક્ષણિક વર્ષ જુન, ૨૦૨૫ થી અમલવારી કરવાની રહે છે. લાઈફ સાયન્સ વિદ્યાશાખાનાં અભ્યાસક્રમ ચલાવતી તમામ સંલગ્ન કોલેજો ધ્વારા તેની અમલવારી કરવા જણાવવામાં આવે છે.




ખાસ ફરજ પરના અધિકારી
(એકેડેમિક)

ક્રમાંક/બીકેએનએમયુ/ એકેડેમિક/૭૪૭/૨૦૨૫

ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી,

સરકારી પોલીટેકનિક કેમ્પસ,

ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી રોડ,

ખડીયા, જૂનાગઢ-૩૬૨૨૬૩

તા.૦૩/૧૧/૨૦૨૫

પ્રતિ,

- ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી સંલગ્ન લાઈફ સાયન્સ વિદ્યાશાખાનાં અભ્યાસક્રમો ચલાવતી તમામ કોલેજોના આચાર્યશ્રીઓ તરફ....

નકલ સાદર રવાના:-

- માન.કુલપતિશ્રી/ કુલસચિવશ્રીનાં અંગત સચિવશ્રી.
- પરીક્ષા નિયામકશ્રી, ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી, જૂનાગઢ

નકલ રવાના જાણ તથા યોગ્ય કાર્યવાહી અર્થે:

- સીસ્ટમ મેનેજરશ્રી, આઇ.ટી.સેલ વિભાગ (વેબસાઇટ ઉપર પ્રસિદ્ધ થવા અર્થે.)



BHAKTA KAVI NARSINH MEHTA UNIVERSITY
JUNAGADH



BOARD OF STUDIES

FACULTY OF LIFE SCIENCE

SYLLABUS FOR MICROBIOLOGY (HONOURS)

PROGRAMME (SEMESTER- VI)

EFFECTIVE FROM JUNE, 2025

BHAKTA KAVI NARSINH MEHTA UNIVERSITY
Syllabus of **B.Sc. (Honors)** as per NEP-2020
Faculty of **Life Sciences**
Effective from June 2025
Subject: Microbiology
SEMESTER- VI

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-6	1	Major-14	Prokaryotic Metabolism	5.5	04	60	50	50	100	02:00 Hours
	2	Major-15	Immunology and Infectious Disease	5.5	04	60	50	50	100	02:00 Hours
	3	Major-16	Combine Practical	5.5	04	120	50	50	100	04:00 Hours
	4	Minor-6	Veterinary Microbiology	5.5	04 (3T + 1P)	75 (45T + 30P)	50	50	100	04:00 Hours
				Total	16		200	200	400	

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Course Level	5.5	Internal Marks	50
Programme	B.Sc. Microbiology	External Marks	50
Semester	VI	Practical Internal	-
Category of Course	MAJOR-14	Practical External	-
Course Credit	04	Prac. External Exam Duration	-
Teaching Hours	60	Total	100
Course Code	MAJMBT601	Exam Duration	02:00 Hours
Course Title	Prokaryotic Metabolism (Theory)		

Course Objectives:

- To classify and differentiate the major nutritional and energy-acquiring groups of prokaryotes, including phototrophs, chemotrophs, autotrophs, and heterotrophs.
- To analyze and explain key universal metabolic pathways (e.g., glycolysis, TCA cycle, electron transport chain) as they operate in prokaryotes, highlighting any unique bacterial or archaeal variations.

Course Learning Outcomes: After completion of the course:

- Students will be able to classify any given prokaryote into its correct nutritional category as photoautotroph, photoheterotroph, chemoautotroph, or chemoheterotroph based on its source of energy and carbon.
- Students will be able to analyze the key steps, reactants, products, and enzyme regulation points of universal pathways like Glycolysis, the TCA Cycle, and the Electron Transport Chain.
- Students will be able to calculate and compare the net ATP yield for a prokaryote utilizing different metabolic modes as aerobic respiration vs. fermentation vs. anaerobic respiration from a single substrate molecule.

Course Contents

Sem	Unit No.	Syllabi	Teaching Hours
6	1	Metabolism, Bioenergetics and Enzyme kinetics • Bioenergetics: The concept of free energy, Determination of ΔG & Energy rich compounds • Energy metabolism: Role of ATP in metabolism, Role of reducing power in metabolism, Role of precursor metabolites in metabolism	15

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		- Non-Regulatory Enzymes: Derivation of the Michaelis - Menten Equation - Regulatory Enzymes: Conformational changes in Regulatory Enzymes.	
	2	Heterotrophic Mode of Metabolism - Catabolism of Carbohydrates: - Glycolysis and its regulation - The Pentose phosphate pathway - The Entner - Doudroff pathway - The Citric acid cycle and its regulation - The Glyoxylate cycle - Catabolism of protein and amino acids: General reactions of amino acids catabolism, Stickland Reactions - Catabolism of lipids: Oxidation of Fatty Acids, Beta-Oxidation of Fatty Acids.	15
	3	Energy Generation and Anabolism - Different modes of ATP generation - Electron transport chain: Introduction, Components of ETC and energy yield - Anaerobic Respiration - Methods of studying biosynthesis: Strategy of Biosynthesis, Use of Biochemical Mutants, Use of Isotopic Labeling - Bacterial photosynthesis.	15
	4	Metabolism in Specific Microbial Systems - Chemo-autotrophs: Nitrifying Bacteria, Sulfur Oxidizers, Iron bacteria, Hydrogen Bacteria - The lactic acid bacteria: Patterns of carbohydrate fermentation in lactic acid bacteria - The Enteric group and related Eubacteria: Fermentative patterns of Gram-negative Eubacteria - Archaeobacteria: Energy metabolism and Carbon-Assimilation in Methanogens, photophosphorylation in <i>Halobacterium</i>.	15

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 Daginawala Vol-1

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Course Level	5.5	Internal Marks	50
Programme	B.Sc. Microbiology	External Marks	50
Semester	VI	Practical Internal	-
Category of Course	MAJOR-15	Practical External	-
Course Credit	04	Prac. External Exam Duration	-
Teaching Hours	60	Total	100
Course Code	MAJMBT602	Exam Duration	02:00 Hours
Course Title	Immunology and Infectious Disease (Theory)		

Course Objectives:

- To establish a strong foundation in the principles of the immune system, including the components, functions, and distinctions between innate and adaptive immunity.
- To detail the processes of antigen recognition, lymphocyte activation, antibody production, and the dysfunctionalities of immunology.

Course Learning Outcomes: After completion of the course:

- Students will be able to accurately identify and describe the cellular and molecular components of the innate and adaptive immune systems, and their respective primary and secondary lymphoid organs.
- Students will be able to interpret the results of foundational immunological assays (like agglutination tests or simple ELISA data) based on their understanding of antigen-antibody interactions.
- Students will be able to apply these principles to understand basic immunological phenomena, such as hypersensitivity, autoimmunity, and immunodeficiency.

Course Contents

Sem	Unit No.	Syllabi	Teaching Hours
6	1	Immunology and Defense • Types of immunity: Natural, Acquired, herd, Innate, specific • Structure, functions and properties of Immune Cells: Stem cell, T cell, B cell, NK cell, Macrophage, Neutrophil, Eosinophil, Basophil, Mast cell, Dendritic cell • Central (Primary) lymphoid organs, Peripheral (Secondary) lymphoid organs	15

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		• Characters of immune system.	
	2	Immune Response • Primary and Secondary Immune Response • Generation of Humoral Immune Response (Plasma and Memory cells) • Structure and properties of class I and II MHC • Generation of Cell Mediated Immune Response (Self MHC restriction, T cell activation, Co- stimulatory signals) • Killing Mechanisms by CTL and NK cells • Cytokines (overview of Interleukin, interferon and Tumour necrosis factors and Chemokines) • Phagocytosis, Inflammation, Opsonisation, Complement system, an overview • Antigen processing and presentation	15
	3	Antigen and Antibody • Antigen a. Immunogenicity versus antigenicity b. Factors influencing Immunogenicity c. Adjuvant, Epitopes and Haptens • Antibody a. Basic structure of Antibody. b. Immunoglobulin classes and their Biological activities c. Epitopes and Receptors on immunoglobulin molecule d. Antibody Diversity and Clonal Selection Theory e. Overview of Monoclonal Antibody and polyclonal antibody • Interactions a. Agglutination b. Precipitation	15
	4	Immune Dysfunctionalities • Immunodeficiency Diseases • Hypersensitivity • Autoimmune diseases • Overview of Tumor immunity • Overview of Transplantation immunity	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	5.5	Internal Marks	-
Programme	B.Sc. Microbiology	External Marks	-
Semester	VI	Practical Internal	50
Category of Course	MAJOR-16	Practical External	50
Course Credit	04	Prac. External Exam Duration	04:00 Hours
Teaching Hours	120	Total	100
Course Code	MAJMBP603	Exam Duration	04:00 Hours
Course Title	Combine practical (Practical)		

Course Objectives: To study and improve the hands-on practical skills in microbiology, and immunology.

Course Learning Outcomes: After completion of the course:

- Students gain knowledge on prokaryotic metabolisms and its energies and immunity response and defence mechanisms.
- Students deeply understand through experimental skill.
- Have acquired the knowledge the analysis enzymes, bloods cell counts and medical problems.

Course Contents

Sem	No.	Syllabi	Teaching Hours
6	1	Determination of Vmax and Km for amylase enzyme by performing substrate curve with line weaver Burk plot..	120
	2	Determination of Vmax and Km for phosphatase by performing substrate curve with line weaver Burk plot.	
	3	Effect of temperature on amylase activity.	
	4	Effect of pH on amylase activity	
	5	Study of Diauxic growth curve in <i>E. coli</i> .	
	6	Determination of amino acid decarboxylase activity.	
	7	Preparation of Winogradsky column (Demonstration).	
	8	Identification of blood cells through microscopy	
	9	Total count of RBC	
	10	Total count of WBC	
	11	Differential count of WBC	

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	12	Isolation of normal flora of skin	
	13	Isolation of normal flora of mouth	
	14	Understanding of the medical problems (Case Study)	
	15	ABO blood grouping	
	16	Dot ELISA	
	17	Study of media composition used of differential and selective media as EMB, MacConkey, SS agar , TCBS agar, Blood agar etc.	

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
7. Medical Bacteriology, Mycology and AIDS – N.C. Dey, T.K. Dey, D.Sinha

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Course Level	5.5	Internal Marks	25
Programme	B.Sc. Microbiology	External Marks	50
Semester	VI	Practical Internal	25
Category of Course	MINOR-6	Practical External	-
Course Credit	04 (03T+01P)	Prac. External Exam Duration	02:00 Hours
Teaching Hours	75 (45T+30P)	Total	100
Course Code	MINMBT601	Exam Duration	02:00 Hours
Course Title	Veterinary Microbiology (Theory)		

Course Objectives:

- To explore the concept of veterinary microbiology and biotechnology
- Study the various disease caused in animal and its characteristics and routes.

Course Learning Outcomes: After completion of the course:

- Developed basic concepts of the causation of diseases by different types of microorganisms.
- Developed knowledge of the common diseases of microbial etiology for animals especially the domesticated animals and the vaccines available for animal immunization.
- Acquired skills on the laboratory identification of disease-causing microbes and antibiotic sensitivity testing.

Course Contents

Sem	Unit No.	Syllabi	Teaching Hours
6	1	Characteristics of Microorganisms • Physiochemical and biological characteristics of microorganisms (including viruses). • Introduction to oncogenic viruses. Types of oncogenic DNA and RNA viruses. • Bacterial structure, Nutritional requirements of bacteria, Types of media, Physical conditions required for bacterial growth, Bacterial growth curve, methods of measurement of bacterial growth.	12
	2	Microbial Techniques	11

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		- Pure culture isolation: Streaking, serial dilution and plating methods; cultivation, maintenance and preservation/stocking of pure cultures; cultivation of anaerobic bacteria. - Buffers in culture medium. Cultivation of fungi, actinomycetes, yeasts, Cultivation of anaerobes.	
	3	Source and Routes Sources and routes of infection, Transmission of pathogens, portals of entry of pathogen, Microorganisms and animal host interactions, Toxins (endo and exo).	10
	4	Animal Diseases - Study the animal diseases with respect to etiology, symptoms, mode of transmission, prophylaxis and control: Q fever FMD, swine flu, bird flu, Rabies, bovine tuberculosis, Infections caused by Campylobacter, Salmonella Marek's, ranikhet, brucellosis, distemper. - Common cattle diseases Bovine Respiratory Disease Complex (BRDC), Clostridial Disease, or "Blackleg", BRSV (Bovine Respiratory Syncytial Virus) BVD (Bovine Viral Diarrhea) (Infectious Bovine Rhinotracheitis), (Parainfluenza Type 3), Pasteurella haemolytica and Pasteurella multocida.	12

Suggested Reading:

1. Textbook of Veterinary Microbiology (2015) By Sharma S.N. Vikas Publishing.
2. General Veterinary Microbiology - An introduction (2017) By R.P. Diwakar R.K. Diwakar Astral Publishing.
3. Veterinary Microbiology and Microbial Disease (2011), 2nd Edition By P. J. Quinn, B. K. Markey, F. C. Leonard, P. Hartigan, S. Fanning, E. S. Fitzpatrick Wiley.
4. N. Maclachlan Edward J Dubovi Fenner's Veterinary Virology 5th Edition Academic Press (2016).
5. G. R. Carter, Darla J. Wise. Essentials of Veterinary Bacteriology and Mycology, Wiley-Blackwell (2003).
6. P. J. Quinn, B. K. Markey, F. C. Leonard, P. Hartigan, S. Fanning, E. S. Fitzpatrick. Veterinary Microbiology and Microbial Disease. Wiley-Blackwell (2011).

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Practical Course (Minor-6)

Sem	No.	Syllabi	Teaching Hours
6	1	Staining: Gram staining and Acid fast staining, motility by Hanging drop method.	30
	2	Study of following equipment including care and maintenance: Optical microscope Incubator Hot air oven Autoclave Autopipette	
	3	Preparation of commonly and selective used media, Inoculation of culture plates (streak and spread plate) and broth media.	
	4	Biochemical tests: Sugar fermentation, IMViC, Catalase, Oxidase, Urease etc.	
	5	Microbial count from the animal sample.	
	6	Antibiotic sensitivity testing Using disc. (Gram positive and Gram-negative bacteria).	
	7	Hemolytic activity of animal pathogens	
	8	Microbial diauxic growth curve.	

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. International student edition: Microbiology- A laboratory Manual 4th edition. by James G. Chappuccino & Natalie Sherman.

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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