Re-Accredited 'B++' 2.86 CGPA by NAAC
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વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી
યુનિવર્સિટી કેમ્પસ, ઉધના-મગદલ્લા રોડ, સુરત - ૩૯૫ ૦૦૭, ગુજરાત, ભારત.
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–: પરિપત્ર :–

યુનિવર્સિટી સંલગ્ન વિજ્ઞાન વિદ્યાશાખા હેઠળની તમામ કોલેજોનાં આચાર્યશ્રીઓને જણાવવાનું કે, શૈક્ષણિક વર્ષ ૨૦૨૪–૨૫ થી અમલમાં આવેલ B.Sc. Medical Laboratory Technology Sem.-3 & 4 ના અભ્યાસક્રમના PSO અને CO અંગે મેડિકલ ટેકનોલોજી વિષયની અભ્યાસ સમિતિની તા.૨૬/૦૪/૨૦૨૫ ની સભાના ઠરાવ ક્રમાંકઃ૦૫ થી નીચે મુજબ કરેલ ભલામણ સ્વીકારી વિજ્ઞાન વિદ્યાશાખાની તા.૩૦/૦૪/૨૦૨૫ની સભાનાં ઠરાવ ક્રમાંકઃ૪૫ થી કરેલ ભલામણ સ્વીકારી એકેડેમિક કાઉન્સિલની તા.૦૫/૦૫/૨૦૨૫ ની સભાનાં ઠરાવ ક્રમાંકઃ૧૦૯ થી મંજુર કરેલ છે. જે સંદર્ભે સદર PSO અને CO સાથેના અભ્યાસક્રમનો અમલ કરવા આથી જાણ કરવામાં આવે છે.

બિડાણઃ ઉપર મુજબ

ક્રમાંકઃઓથો./પરિપત્ર/સિલેબસ/૧૨૧૮૮/૨૦૨૫
તા.૦૨–૦૬–૨૦૨૫

કુલસચિવ

પ્રતિ,
૧) યુનિવર્સિટી સંલગ્ન વિજ્ઞાન વિદ્યાશાખા હેઠળની તમામ કોલેજોનાં આચાર્યશ્રીઓ.
.....આપશ્રીની કોલેજના સંબંધિત શિક્ષકોને જાણ કરી અમલ કરવા સા.રૂ.
૨) ડીનશ્રી, વિજ્ઞાન વિદ્યાશાખા.
૩) પરીક્ષા નિયામકશ્રી, પરીક્ષા વિભાગ, વીર નર્મદ દ. ગુ. યુનિવર્સિટી, સુરત.
.....તરફ જાણ તેમજ અમલ સા.રૂ.

Veer Narmad South Gujarat University, Surat

Syllabus of

B. Sc. Medical Laboratory Technology

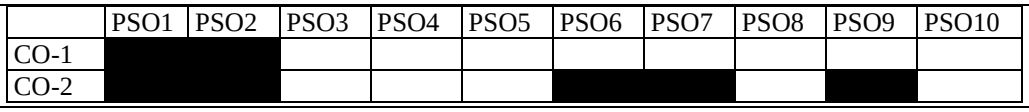
(As per NEP- 2020)

Effective from 2024 - 2025

SEMESTER – III							
Course Code	**Title of The Course**	**Course Credit**	**Hrs. Per Week**	**Internal Exam Marks (CCE)**	**External Exam Marks (SEE)**	**Duration of External Exam (Hr.)**	**Total Marks**
MLT-MJ-301	Basics of Immunology	02	02	25	25	01	50
MLT-MJ-302	Basics of Microbiology	02	02	25	25	01	50
MLT-MJ-303	General Biochemistry	04	04	50	50	02	100
MLTP-MJ-301	Practicals Based on Basics of Immunology	02	04	25	25	06	50
MLTP-MJ-302	Practicals Based on Basics of Microbiology	02	04	25	25	06	50
	Total	12	16	150	150		300
SEMESTER – IV							
MLT-MJ-401	Basics of Hematology	02	02	25	25	01	50
MLT-MJ-402	Bacterial Culture Technique	02	02	25	25	01	50
MLT-MJ-403	Instrumentation	04	04	50	50	02	100
MLTP-MJ-401	Practicals Based on Basics of Hematology	02	04	25	25	06	50
MLTP-MJ-402	Practicals Based on Bacterial Culture Technique	02	04	25	25	06	50
	Total	12	16	150	150		300

SEMESTER III

MLT-MJ-301: BASICS OF IMMUNOLOGY

Semester: III	
Course Code	MLT-MJ-301
Course Title	Basics of Immunology
Course Type	Major
Credit	2
Course Level	200-299
Teaching Hour/ Week	2 Hours
Teaching Time	15×2= 30 Hours
Course Objective	• The main objective of the course is to provide the students with a sound introduction to modern, basic human immunology. The field of immunology will be scrutinized by addressing both the normal functionality of the immune system, and immuno-related diseases. • to understand the fundamental principles of the immune system, including how the body recognizes and responds to foreign substances, and to explore the applications of these reactions in diagnostics and therapeutics.
Course Outcome	At the end of the course, the students will **CO-1:** Understand basic aspects of immunity. The student will also obtain the basic knowledge of Immune system and the cells involved **CO-2:** Studying antigen-antibody reactions equips you with knowledge to understand the immune system's function, diagnose diseases through immunoassays, and develop new therapies, ultimately contributing to better healthcare outcomes.
Mapping between COs and PSOs	

Course Content:

Unit No.	Content	Teaching Hours
Unit-1	**Immunity and Immune System**	**15 Hr.**
1.1	Introduction, Definition, Classification of Immunity	
1.2	Innate immunity: Types and Mechanisms	
1.3	Acquired immunity: Types and Mechanisms	
1.4	Organs of the immune system	
1.5	Cells of the immune system	
Unit-2	**Antigen & Antibody**	**15 Hr.**
2.1	Antigen: Introduction, Definition, Types, Properties	
2.2	Antibody: Introduction, Definition, Structure, Function, Classes and Properties of Immunoglobulin's	
2.3	Antigen- Antibody Reactions: General features and Factors Affecting, Stages and Types	
2.4	Precipitation Reaction	
2.5	Agglutination Reaction	

Reference Books:

Sr. No.	Title/Edition	Authors	Publisher
1	Textbook of Microbiology. 8th (2009)	Ananthanarayan R. and Paniker C.K.J.	University Press Publication
2	Textbook of Microbiology & Immunology/ 2nd	Subhash Chandra Parija	Elsevier
3	Essential Immunology/6th	I. M. Roitt	ELBS, London
4	Text book of Medical Microbiology/ 5th	R. Ananthnarayan C. K. Jayram Paniker	Orient Longman, Madras.
5	Immunology/ 1st	B. S. Nagoba, D. V. Vedpathak	BI publications Pvt Ltd, New Delhi
6	Immunology/ 1st	I Kannan	MJP Publishers

MLT-MJ-302: BASICS OF MICROBIOLOGY

Semester: III	
Course Code	MLT-MJ-302
Course Title	Basics of Microbiology
Course Type	Major
Credit	2
Course Level	200-299
Teaching Hour/ Week	2 Hours
Teaching Time	15×2= 30 Hours
Course Objective	• Studying the history of microbiology aims to provide a foundational understanding of the field, its key figures, and landmark discoveries. • The course contents are designed to gain knowledge about eukaryotes and prokaryotes, ultrastructure of bacteria, Virus, fungi and parasite. The learner will acquire basic knowledge about the microbial world.
Course Outcome	At the end of the course, the students will be acquainted with the **CO-1:** Role of scientist in evolution of Microbiology, Sketch the historical events in the developments of Microbiology as a discipline emphasizing the contributions of the scientists. Discuss various microscopes and compare the different types of light and electron Microscope. Know the various staining techniques and to distinguish their application in Microbiology. **CO-2** Students will be clear with Types of Microorganism, Structure and characteristics, Compare the difference between the basic cell types viz, Eukaryote, Prokaryote, Virus, Fungi and parasite, describe the ultra-structure of a bacterial cell helping to study the further biochemical and physiological reactions inside the cell.
Mapping between COs and PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO-1										
CO-2										

Course Content:

Unit No.	Content	Teaching Hours
Unit-1	**History of Microbiology**	**15 Hr.**
1.1	Introduction	
1.2	Antony Van Leeuwenhoek and His Microscope	
1.3	Controversy of Spontaneous Generation	
1.4	Scientific Development of Microbiology: Contributions of Louis Pasteur, Joseph Lister, Robert Koch, Paul Ehrlich and Important Discoveries by Other Scientists	
1.5	Development of Pure Culture Technique	
Unit-2	**Introduction to Microorganism**	**15 Hr.**
2.1	Bacteria: Characteristic difference between Procaryotic and Eucaryotic cell, Morphological Classification, Cell Structure study, Difference between Gram positive and Gram negative, Observation of Bacteria by Staining Techniques: Simple, Differential and	

	Special (Capsule, Metachromatic, Spore and Spirochaete)	
2.2	Virus: General Structure, Morphology and Classification	
2.3	Fungi: General Property and Classification	
2.4	Parasite: Terminology used, Classes of Host and Parasite, Sources of Infection and Portal of Entry	

Reference Books:

Sr. No.	**Title/Edition**	**Authors**	**Publisher**
1	Textbook of Medical Laboratory Technology, 3rd Edition, Volume 1	Praful B. Godkar & Darshan B. Godkar	Bhalani Publishing House Mumbai, India
2	Textbook of Microbiology/ 2nd	Prof. C. P. Baveja	Arya Publications
3	Elementary Microbiology, Fundamentals of Microbiology, Vol-1	Modi H.A.	Ekta Prakashan
4	Medical Laboratory Technology Methods and Interpretations, Volume 1, 6th Edition	Ramnik Sood	Jaypee Brothers Medical Publishers (P) LTD

MLT-MJ-303: GENERAL BIOCHEMISTRY

Semester: III	
Course Code	MLT-MJ-303
Course Title	General Biochemistry
Course Type	Major
Credit	4
Course Level	200-299
Teaching Hour/ Week	4 Hours
Teaching Time	15×4= 60 Hours
Course Objective	The objective is to provide students with an understanding of biomolecules, the basic building blocks of living organisms, focusing on their structure, unique properties, biological roles and functions and inter relations.
Course Outcome	At the end of the course, the students **CO-1:** will get knowledge and understand the basic concepts of carbohydrates to develop interest in the metabolic role of these carbohydrates **CO-2 Understand lipid structures and functions,** grasp the role of lipids as a primary energy reserve, understand the importance of essential fatty acids and their health benefits. Learn about the role of lipids in diseases like atherosclerosis, obesity, and diabetes. **CO-3** They will understand different ways to classify amino acids, Students will grasp the roles of amino acids as building blocks of proteins, as well as their involvement in various metabolic pathways and as precursors for other important molecules They will understand different ways to classify proteins based on their structure, function, and location, learn the diverse functions of proteins, including structural, enzymatic, transport, signalling, and defence roles. Students will understand the clinical significance of amino acids and proteins in various diseases and disorders. **CO-4** Studying nucleic acids, like DNA and RNA, allows students to understand the fundamental building blocks of life, genetic information storage, and molecular mechanisms of inheritance and gene expression.
Mapping between COs and PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO-1										
CO-2										

Course Content:

Unit No.	Content	Teaching Hours
Unit-1	**Carbohydrates**	**15 Hr.**
1.1	Classification and Biological role of carbohydrates	
1.2	Monosaccharides	
1.3	Disaccharides	
1.4	Polysaccharides	
Unit-2	**Lipids**	**15 Hr.**
2.1	Classification and Biological role of lipids	
2.2	Simple lipids: Triglyceride	

2.3	Compound lipids: Phospholipid, Glycolipid and Lipoprotein	
2.4	Derived lipids: Cholesterol and Fatty acid	
Unit-3	**Amino Acid and Proteins**	**15 Hr.**
3.1	Definition and Classification of Amino Acids	
3.2	Classification & Biological role of proteins	
3.3	Structural organization of proteins	
3.4	Denaturation of Protein	
Unit-4	**Nucleic acids**	**15 Hr.**
4.1	Nitrogen bases, Nucleoside, Nucleotide	
4.2	Structure of DNA (Watson-Crick model, variants)	
4.3	Structure of RNA	
4.4	Biological functions of nucleic acids	

Reference Books:

Sr. No.	Title/Edition	Authors	Publisher
1	Textbook of Medical Laboratory Technology, 3rd Edition, Volume 1	Praful B. Godkar & Darshan B. Godkar	Bhalani Publishing House Mumbai, India
2	Medical Laboratory Technology - A Procedure Manual for Routine Diagnostic tests, Volume 1/ 2nd Edition	Kanai L. Mukherjee	Tata Mc Graw -Hill Education Private Limited, New Delhi
3	Fundamentals of Biochemistry	J. L Jain, Sunjay Jain, Nitin Jain	S Chand & company, New Delhi
4	Biochemistry	U. Satyanarayan	Books & Allied pvt Ltd, Kolkatta.

MLTP-MJ-301: PRACTICALS BASED ON BASICS OF IMMUNOLOGY

Semester: III	
Course Code	MLTP-MJ-301
Credit	02
Teaching Hour/ Week	4 Hours
Course Title	Practicals Based on Basics of Immunology
Course Objectives	Aim is to provide students with hands-on experience and practical skills in immunological techniques, enabling them to understand and apply immunological concepts in a laboratory setting.
Course Outcome	Upon completion of an immunology practical course, students should be able to perform common immunological techniques, analyze results, and understand the principles and applications of immunology in various fields. **CO-1, 2, 4, 5, 7, 8:** After completing an agglutination practical, students should be able to understand and apply the principles of agglutination, perform agglutination tests, interpret results, and understand the applications of agglutination in diagnostics and other fields. They will learn about specific tests done in case of diagnosis of specific disease. Students will be able to check blood group of patients which is basic in laboratories. **CO-3**: The student will learn about the principle and interpretation of Immunochromatography technique. **CO-6**: Students will learn widely used Tube test for typhoid and its interpretation using different Salmonella antigens
Mapping between COs and PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO-1, 2, 4, 5, 7, 8		■					■		■	
CO-3		■					■			
CO-6		■					■		■	

Course Content

1. Rapid Test for Syphilis.
2. To Perform ABO and Rh blood grouping (Slide test)
3. Test for Pregnancy by rapid agglutination / Strip method
4. Test for RA by agglutination method
5. Test for Typhoid by WIDAL slide test
6. Test for Typhoid by WIDAL tube test
7. Determination of ASO by rapid agglutination test.
8. Determination of CRP by rapid agglutination test.

Reference Books:

Sr. No.	**Title/Edition**	**Authors**	**Publisher**
1	Practical Manual for Medical Laboratory Technology-Volume-1/ 1st	Mayuri Dholaria, Jigna Naik, Urvashi Desai & Rinku Shukla	Popular
2	A Hand book of Practical Immunology/1st	G.P. Talwar	Vikas Publishing House.

3	Medical Laboratory Technology/ 4th	Sood R.	Jaypee Brothers.
4	Textbook of Medical Laboratory Technology	P. B. Godkar, D.P. Godkar	Bhalani Pub.

MLTP-MJ-302: PRACTICALS BASED ON BASICS OF MICROBIOLOGY

Semester: III	
Course Code	MLTP-MJ-302
Credit	02
Teaching Hour/ Week	4 Hours
Course Title	Practicals Based on Basics of Microbiology
Course Objectives	• To Differentiate between simple and differential stains • Explain the procedures and name clinical applications for special staining techniques to Identify bacterial cell shapes and cell arrangements and internal structures. • Evaluate and interpret staining results correctly • To have an idea about morphology of fungi and observation of parasites.
Course Outcome	At the end of the course, the students will able to, **CO1-9**: Perform motility and various staining techniques for study of bacteria and its structure **CO-10**: Identify fungi from its morphological features. **CO-11**: The students will be able to observe parasites in hay infusion **CO-12**: Various morphology of virus will be clear through charts and diagrams of different structures of virus
Mapping between COs and PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO 1-9										
CO 10-12										

Course Content

1. Observation of Bacteria by Wet mount and Hanging drop preparation
2. Morphological study of bacteria by Simple staining technique
3. Morphological study of bacteria by Negative staining technique
4. Differential Study of Bacteria by Gram staining technique
5. Differential Study of Bacteria by Acid-fast staining technique
6. Observation of Spirochaete by Fontana's method
7. Observation of capsule by Maneval's staining technique
8. Observation of metachromatic granules by Albert's staining technique
9. Observation of spore by special staining technique
10. Morphological study of fungi
11. Study of Parasites by Hay infusion
12. Study of general structure of viruses (Diagram/Chart/Model)

Reference Books:

Sr. No.	Title/Edition	Authors	Publisher
1	Practical Manual for Medical Laboratory Technology-Volume-1/ 1st	Mayuri Dholaria, Jigna Naik, Urvashi Desai & Rinku Shukla	Popular
2	Textbook of Medical Laboratory Technology, 3rd Edition, Volume 1	Praful B. Godkar & Darshan B. Godkar	Bhalani Publishing House Mumbai, India
3	Elementary Microbiology, Fundamentals of Microbiology, Vol-1	Modi H.A.	Ekta Prakashan
4	Medical Laboratory Technology Methods and Interpretations, Volume 1, 6th Edition	Ramnik Sood	Jaypee Brothers Medical Publishers (P) LTD

SEMESTER IV

MLT-MJ-401: BASICS OF HEMATOLOGY

Semester: IV	
Course Code	MLT-MJ-401
Course Title	Basics of Hematology
Course Type	Major
Credit	2
Course Level	200-299
Teaching Hour/ Week	2 Hours
Teaching Time	15×2= 30 Hours
Course Objective	To learn about the concept of hematology and routine hematological examination like Haemoglobin, Complete blood count, ESR, PCV and its abnormality resulting in diseases
Course Outcome	At the end of the course, the students will get knowledge of **CO-1:** Blood, its functions and Formation/Synthesis, Morphology and functions of blood cell **CO-2:** Different estimation methods of hemoglobin, detailed study of Red Cells, White cells, Platelets, Blood indices, ESR and their clinical significance
Mapping between COs and PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1										
CO2										

Course Content:

Unit No.	Content	Teaching Hours
Unit-1	**Introduction to Hematology**	**15 Hr.**
1.1	Blood: Components and Function	
1.2	Blood Collection Methods	
1.3	Anticoagulants	
1.4	Introduction to Hematopoiesis	
Unit-2	**Complete Blood Cell Count**	**15 Hr.**
2.1	Haemoglobin and its Estimation	
2.2	Red Blood Cell Count and its Morphology	
2.3	White Blood Cell Count and its Morphology	
2.4	Platelet Count	
2.5	Red Cell Indices and ESR	

Reference Books:

Sr. No.	Title/Edition	Authors	Publisher
1	Textbook of Medical Laboratory Technology, 3rd Edition, Volume 1	Praful B. Godkar & Darshan B. Godkar	Bhalani Publishing House Mumbai, India
2	Practical Manual for Medical Laboratory Technology-Volume-2/ 1st	Mayuri Dholaria, Jigna Naik,	Popular

		Urvashi Desai & Rinku Shukla	
3	Medical Laboratory Science - Theory and Practice	J. Ochei & A. Kolhatkar	Tata Mc Graw -Hill Publishing Limited Company, New Delhi
4	Hand book of Medical Laboratory Technology	Bharucha, Meyerm Moody, Carman,	CMC Vellore
5	Practical Haematology/ 8th	A. Dacie & S. M. Lewis	ELSEVIER

MLT-MJ-402: BACTERIAL CULTURE TECHNIQUE

Semester: IV	
Course Code	MLT-MJ-402
Course Title	Bacterial Culture Technique
Course Type	Major
Credit	2
Course Level	200-299
Teaching Hour/ Week	2 Hours
Teaching Time	15×2= 30 Hours
Course Objective	To accomplish basic experiments to grow and study microorganisms in the laboratory. Have developed a very good understanding of the characteristics of different types of microorganisms, methods to organize/classify these into and basic tools to study these in the laboratory.
Course Outcome	At the end of the course, the students will get knowledge of **CO-1:** Describe the nutritional requirements of bacteria for growth; developed knowledge and understanding of culture media, aerobic and anaerobic culture technique, isolation pure cultures and preservation cultures **CO-2:** Differentiate a large number of common bacteria by their salient characteristics; classify bacteria into groups. Isolation of bacteria from mixed culture. Study morphological, cultural, biochemical characteristics common bacterial pathogen
Mapping between COs and PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1										
CO2										

Course Content:

Unit No.	**Content**	**Teaching Hours**
Unit-1	**Isolation of Bacteria**	**15 Hr.**
1.1	Introduction: Pure Culture and Natural Microbial Population (Mixed Culture)	
1.2	Types of Culture Media: Classification Based on (i) Physical state, (ii) Presence of Molecular Oxygen and Reducing Substances (iii) Nutritional Factors	

1.3	Separation of Bacteria by Culture Methods: Streak Plate Technique, Pour Plate Technique, Spread Plate Technique, Serial Dilution Culture Technique and Enrichment Culture Technique, Use of selective and Differential Media	
1.4	Other Methods: Single Cell Isolation, Use of Laboratory Animals and Isolation of Anaerobes	
1.5	Maintenance and Preservation of Cultures	
Unit-2	**Identification of Bacteria**	**15 Hr.**
2.1	Introduction: Bacterial Identification Methods: Conventional Method, Antigenic Structure, Typing Method, Pathogenicity Test and Antibiotic Sensitivity Test	
2.2	Morphological Identification by Microscopic Examination of Unstained and Stained Preparation	
2.3	Macroscopic Identification Technique: Colony Characteristics, Growth Characteristics and Biochemical Characteristics.	
2.4	Identification Characteristics of Common Gram-Positive Bacteria: *Staphylococcus aureus*, *Bacillus cereus* and *Streptococcus spp*.	
2.5	Identification Characteristics of Common Gram-Negative Bacteria: *Escherichia coli, Enterobacter aerogenes, Klebsiella pneumoniae, Proteus vulgaris, Pseudomonas aeruginosa* and *Salmonella spp.*	

Reference Books:

Sr. No.	Title/Edition	Authors	Publisher
1	Textbook of Microbiology/ 2nd	Prof. C. P. Baveja	Arya Publications
2	Textbook Microbiology and Immunology/ 2nd	Subhash Chandra Parija	ELSEVIER, Elsevier India Private Limited, New Delhi
3	Elementary Microbiology, Fundamentals of Microbiology/ Vol-1	Modi H.A.	Ekta Prakashan
4	Textbook Microbiology/ 8th	Ananthanarayan and Paniker's	University Press India Private Limited, Hyderabad
5	Microbiology/8th	Prescott M, Harley John P.	Mc Graw Hill
6	Basic medical microbiology/ 1st	Patrick R. Murray.	ELSEVIER, Philadelphia, PA

MLT-MJ-403: INSTRUMENTATION

Semester: IV	
Course Code	MLT-MJ-403
Course Title	Instrumentation
Course Type	Major
Credit	4
Course Level	200-299
Teaching Hour/ Week	4 Hours
Teaching Time	15×4= 60 Hours
Course Objective	The structure of the course comprises the instrumental use, study of techniques and other related concepts.
Course Outcome	At the end of the course, the students will get knowledge of **CO-1:** Principle, types, components and uses of various photometric instruments **CO-2:** Principle and technique of electrophoretic techniques **CO-3:** Principle and types of different chromatographic techniques **CO-4:** Types and application of radioactive substances, gamma counter and scintillation counter
Mapping between COs and PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1										
CO2										
CO3										
CO4										

Course Content:

Unit No.	Content	Teaching Hours
Unit-1	**Photometer**	**15 Hr.**
1.1	Introduction, Beers – Lamberts law	
1.2	Colorimeter: Principle, Components, Operation and uses	
1.3	Spectrophotometer: Types, Principle, Components, Operation and Applications	
1.4	Flame Photometer: Principle, Types, Components and Use	
Unit-2	**Electrophoresis**	**15 Hr.**
2.1	Principle	
2.2	Factors Affecting Electrophoresis	
2.3	Support Media: Agarose and Poly Acryl amide Gel	
2.4	Agarose gel Electrophoresis & PAGE	
Unit-3	**Chromatography**	**15 Hr.**
3.1	Introduction	
3.2	Types of Chromatography	
3.3	Paper Chromatography	
3.4	Thin Layer Chromatography	
Unit-4	**Radio Chemical Techniques**	**15 Hr.**

4.1	Radioactive substances and Types of radiation emission	
4.2	GM counter	
4.3	Scintillation counter	
4.4	Biochemical applications of radioisotopes	

Reference Books:

Sr. No.	Title/Edition	Authors	Publisher
1	Analytical Biochemistry: (Biochemical Technique)	P. Ashokan	Chinna Pub., Nelvisharani, Vellor
2	Textbook of Medical Laboratory Technology/3rd	P.B. Godkar	Bhalani Publishering
3	Medical Laboratory Science: Theory & Practice	K. Ochei J. & Kolhatkar A	Tata McGraw Hill Pub.
4	Practical Biochemistry: Principles & Technique/5th	Wilson K. & Walker J	Cambridge University Press

MLTP-MJ-401: PRACTICALS BASED ON BASICS OF HAEMATOLOGY

<table>
<tr><td colspan="2">Semester: IV</td></tr>
<tr><td>Course Code</td><td>MLTP-MJ-401</td></tr>
<tr><td>Credit</td><td>02</td></tr>
<tr><td>Teaching Hour/ Week</td><td>4 Hours</td></tr>
<tr><td>Course Title</td><td>Practicals Based on Basics of Haematology</td></tr>
<tr><td>Course Objective</td><td>The course is intended to focus on the various studies of blood and its components with help of intense laboratory work.</td></tr>
<tr><td>Course Outcome</td><td>At the end of the course, the students can perform routine hematological test of various types a part of a Complete Blood Count (CBC) involved in clinical hematology.
CO-1: Do collection of blood and implement knowledge of anticoagulant use
CO-2: Perform hemoglobin estimation test measures the amount of hemoglobin, used to assess blood levels and can help diagnose or monitor various conditions, including anemia.
CO-3: Total Red Blood Cell (RBC) count to measures the number of red blood cells in a blood sample as an indicator of various health problems.
CO-4: Total White Blood Cell (WBC) Count test measures the total number of white blood cells in blood sample. This test helps to assess immune system's health.
CO-5: Platelet count test in a blood sample measures the number of platelets present in the blood. Platelets are essential for blood clotting and preventing excessive bleeding.
CO-6: Differential WBC count test measures the percentage of each type of white blood cell present in a blood sample. It helps determine if there are abnormalities in the immune system's response to infection or disease.
CO-7: ESR or Erythrocyte Sedimentation Rate test, is a blood test that measures how quickly red blood cells settle in a tube of blood over one hour. It's a non-specific indicator of inflammation in the body and can help in diagnosing or monitoring conditions like autoimmune diseases, infections, or cancers.
CO-8: PCV (Packed Cell Volume) test, also known as a hematocrit test, measures the percentage of red blood cells in blood and helps to assess blood health by evaluating red blood cell volume</td></tr>
<tr><td>Mapping between COs and PSOs</td><td>
<table>
<tr><td></td><td>PSO1</td><td>PSO2</td><td>PSO3</td><td>PSO4</td><td>PSO5</td><td>PSO6</td><td>PSO7</td><td>PSO8</td><td>PSO9</td><td>PSO10</td></tr>
<tr><td>CO1-8</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>
</td></tr>
</table>

Course Content

1. Blood Collection
2. Haemoglobin estimation: Sahli's method and cyanmethemoglobin method
3. Total RBC (Red Blood Cell) Count
4. Total WBC (White Blood Cell) Count
5. Platelet Count

6. Differential WBC Count
7. Determination of ESR (Erythrocyte Sedimentation Rate)
8. Determination of PCV (Packed Cell Volume)

Reference Books:

Sr. No.	Title/Edition	Authors	Publisher
1	Practical Manual for Medical Laboratory Technology-Volume-2/ 1st	Mayuri Dholaria, Jigna Naik, Urvashi Desai & Rinku Shukla	Popular
2	Textbook of Medical Laboratory Technology, 3rd Edition, Volume 1	Praful B. Godkar & Darshan B. Godkar	Bhalani Publishing House Mumbai, India
3	Medical Laboratory Science - Theory and Practice	J. Ochei & A. Kolhatkar	Tata Mc Graw -Hill Publishing Limited Company, New Delhi
4	Practical Haematology/ 8th	A. Dacie & S. M. Lewis	ELSEVIER

MLTP-MJ-402: PRACTICALS BASED ON BACTERIAL CULTURE TECHNIQUE

Semester: IV	
Course Code	MLTP-MJ-402
Credit	02
Teaching Hour/ Week	4 Hours
Course Title	Practicals Based on Bacterial Culture Technique
Course Objective	To know application based bacterial culture methods required to perform different microbiological tests in clinical microbiology lab
Course Outcome	At the end of the course, the students will get knowledge of **CO-1:** Cultivate and study the dynamics of the bacterial growth. **CO-2:** Perform plating procedures without contaminating media. Isolate single bacterial colonies by various plating method. **CO-3:** Perform series of dilutions and then plating aliquots for colony formation and counting, a technique to estimate the number of viable cells in a sample **CO-4:** Bacterial growth on various types of bacteriological media to enhance the ability to differentiate and isolate specific bacterial species. **CO-5:** Key tests of several biochemical reactions which are crucial for bacterial identification. **CO-6:** Evaluation tests commonly used when trying to identify Gram-positive bacteria. **CO-7:** Evaluation tests commonly used when trying to identify Gram-negetive bacteria. **CO-8:** Cultivation of anaerobic organisms employing specific culture methods and techniques.
Mapping between COs and PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1-8										

Course Content

1. Study of growth characteristics of bacteria by Broth, Slant & Stab culture technique
2. Isolation of bacteria by Spread plate method (Glass spreader and cotton Swabs) and Streak plate method
3. To determine Viable cell count by serial dilution technique
4. Study of Cultural and Growth Characteristics on Bacteriological Media: Nutrient Agar, Mac Conkey Agar, Eosin Methylene Agar, W.B. Agar, Blood Agar, Chocolate Agar, MSA
5. Study of some important biochemical reactions:
    a) Indole Test, Methyl red Test, V.P. Test, Citrate Utilization Test, H_2S Production (2% peptone), TSI slants, Sugars Fermentation Test
    b) Test for enzyme activity-Oxidase, Catalase, Coagulase, Urease
6. Identification of Common Gram-Positive Bacteria: *Staphylococcus aureus*, *Bacillus cereus* and *Streptococcus spp*.
7. Identification of Common Gram-Negative Bacteria: *Escherichia coli, Enterobacter aerogenes, Klebsiella pneumoniae, Proteus vulgaris, Pseudomonas aeruginosa* and *Salmonella spp.*

8. Isolation of Anaerobic organisms (Demonstration).

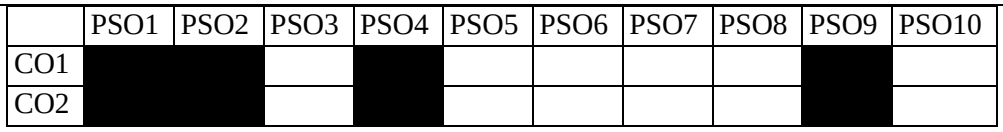
Reference Books:

Sr. No.	Title/Edition	Authors	Publisher
1	Textbook Medical Laboratory Technology, 3rd Edition, Volume 1	Praful B. Godkar & Darshan B. Godkar	Bhalani Publishing House Mumbai, India
2	Experimental Microbiology, Volume 1 & 2	Patel, R. J., and Patel, R. K	Aditya Pub
3	Principles of Microbiology	Atlas R M. Wm. C.	Brown Publishers
4	Practical Manual for Medical Laboratory Technology-Volume-1/ 1st	Mayuri Dholaria, Jigna Naik, Urvashi Desai & Rinku Shukla	Popular

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
B. Sc. Medical Laboratory Technology
Minor Elective Course Structure of Semester IV

Course Code	Title of The Course	Course Credit	Hrs. Per Week	Internal Exam Marks (SEE)	External Exam Marks (CCE)	Duration of External Exam (Hr.)	Total Marks
MLT-ME-401	Blood Banking	02	02	25	25	01	50
MLTP-ME-401	Practicals Based on Blood Banking	02	04	25	25	06	50
	Total	04	06	50	50		100

MLT-ME-401: BLOOD BANKING

Semester: IV	
Course Code	**MLT-ME-401**
Course Title	Blood Banking
Course Type	Minor
Credit	2
Course Level	200-299
Teaching Hour/ Week	2 Hours
Teaching Time	15×2= 30 Hours
Course Objective	To emphasize the basic principles of serology and competency in a clinical blood bank.
Course Outcome	At the end of the course, the students will get knowledge of **CO-1:** Operation of Blood bank, various blood group systems **CO-2:** Detailed knowledge about donors and processing of blood donated units
Mapping between COs and PSOs	

Course Content:

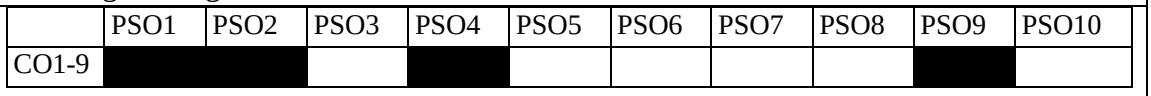
Unit No.	Content	Teaching Hours
Unit-1	**Basic Principles of Immunohaematology**	**15 Hr.**
1.1	Historical overview of Transfusion Medicine	
1.2	Organization and Operation of Blood Bank	

1.3	ABO Blood group system	
1.4	RH blood group system	
1.5	Other blood group systems	
Unit-2	**Blood Collection and Processing**	**15 Hr.**
2.1	Types of Donors-Selection and rejection	
2.2	Collection of blood in blood bags	
2.3	Preservation and storage of Blood	
2.4	Red cell serology-Blood grouping, Cross matching and antiglobulin tests	
2.5	Blood component Preparation-Red cell concentrate, Fresh Frozen Plasma, Platelet Concentrate, Cryoprecipitate	

Reference Books:

Sr. No.	Title/Edition	Authors	Publisher
1	Textbook of Medical Laboratory Technology, 3rd Edition, Volume 2	Praful B. Godkar & Darshan B. Godkar	Bhalani Publishing House Mumbai, India
2	Medical Laboratory Technology - A Procedure Manual for Routine Diagnostic tests, Volume 2/ 2nd Edition	Kanai L. Mukherjee	Tata Mc Graw -Hill Education Private Limited, New Delhi
3	Clinical pathology, Haematology and Blood Banking, 4th Edition	Nanda Maheshwari	Jaypee Brothers; New Delhi
4	Makroo R. N. and Mitra J. *Compendium Transfusion Medicine*.	Dr R.N Makroo	KONGPOSH publication Pvt. Ltd., New Delhi
5.	Essentials of Blood Banking and Transfusion Medicine	Ganga S. Pilli	CBS Publishers, New Delhi

MLTP-ME-401: PRACTICALS BASED ON BLOOD BANKING

Semester: IV	
Course Code	**MLTP-ME-401**
Credit	2
Teaching Hour/ Week	4 hours
Course Title	Practicals Based on Blood Banking
Course Objective	To identify principles and procedures of immunohematology tests including sources of error and clinical significance of results. Will be eligible to serve in any blood bank as per Food and Drug Controller Administration (FDCA) norms.
Course Outcome	At the end of the course, the students will perform all basic tests done in the blood bank and get knowledge of **CO1:** Determination of an individual's blood antigen type, classifying it in ABO group type **CO2:** Determination of an individual's blood antibody type, classifying it in ABO blood group type **CO3:** Determination of an individual's red blood cells have the Rh factor (Rhesus factor). **CO4:** Performing DAT, to determine if antibodies are present on the surface of RBCs. **CO5:** Performing IAT, to determine if antibodies are present in the serum of patients. **CO6:** Anti-A titer test measures the amount of anti-A antibodies in blood to assess compatibility for various medical procedures. **CO7:** Anti-B titer test measures the level of anti-B antibodies in the blood to assess compatibility for various medical procedures. **CO8:** The technique of crossmatch test, a vital safety measure in both blood transfusions and organ transplantation. **CO9:** Blood banking process to separates the blood into its different components, allowing for targeted transfusions.
Mapping between COs and PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1-9										

Course Content

1. ABO blood grouping: a) Forward grouping b) reverse grouping –Slide Method
2. ABO blood grouping: a) Forward grouping b) reverse grouping –Tube Method
3. Rh Typing: Saline, Albumin and AHG method
4. Direct Anti-Human globulin test
5. Determination of incomplete antibody by Indirect Anti-Human globulin test
6. Determination of Anti A titer by saline method
7. Determination of Anti B titer by saline method
8. Cross matching-Major and Minor

9. Blood component preparation (Demonstration)

Reference Books:

Sr. No.	Title/Edition	Authors	Publisher
1	Textbook of Medical Laboratory Technology, 3rd Edition, Volume 2	Praful B. Godkar & Darshan B. Godkar	Bhalani Publishing House Mumbai, India
2	Medical Laboratory Technology - A Procedure Manual for Routine Diagnostic tests, Volume 2/ 2nd Edition	Kanai L. Mukherjee	Tata Mc Graw -Hill Education Private Limited, New Delhi
3	Clinical pathology, Haematology and Blood Banking, 4th Edition	Nanda Maheshwari	Jaypee Brothers; New Delhi
4	Compendium of Transfusion Medicine.	Dr R.N Makroo	KONGPOSH publication Pvt. Ltd., New Delhi
5.	Essentials of Blood Banking and Transfusion Medicine	Ganga S. Pilli	CBS Publishers, New Delhi

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
Skill Enhancement Course Structure of Semester III & IV

Semester & Course Code	Course Title	Credit (Theory)	Teaching duration per Week (in Hr.)	External (Marks) (SEE)	Internal (Marks) (CCE)	Exam Time Duration	Total (Marks)
III MLT-SEC-301	Laboratory Media Preparation - 1	02	02	25	25	01	50
IV MLT-SEC-401	Laboratory Media Preparation - 2	02	02	25	25	01	50

SEMESTER – III
MLT-SEC-301: LABORATORY MEDIA PREPARATION – 1

Semester: III	
Course Code	MLT-SEC-301
Course Title	Laboratory Media Preparation- 1
Course Type	Skill Enhancement Course
Credit	2 (Theory)
Course Level	200-299
Teaching Hour/ Week	2 Hours
Teaching Time	30 hours
Course Objectives	• The primary course objective related to bacterial nutritional media is to understand how to prepare, utilize, and interpret different types of media to support bacterial growth, isolation, and identification.
Course Outcome	At the end of the course, the students will **CO-1** Understand the role of nutritional media in various microbiological applications, such as: ✓ Isolating and identifying bacteria. ✓ Studying bacterial growth and metabolism. ✓ Testing for antibiotic sensitivity. ✓ Monitoring microbial contamination in food and environmental samples. **CO-2** Learn Preparation and composition of broth media and Master the procedures for preparing and sterilizing different types of media using autoclaves. The students will understand the importance of sterilization in preventing contamination.

Mapping between COs and PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
	CO-1										
	CO-2										

Course Content:

Unit No.	Content: Laboratory Media Preparation-I	Teaching Hours
Unit-1	**Nutritional requirements for cultivation of bacteria**	**15 Hr.**
1.1	Nutritional Classification.	
1.2	Culture Media and its types.	
1.3	Common Ingredients of Culture media	
1.4	Solidifying Agent and Basic Preparation of Culture Media	
Unit-2	**Broth Media: Principle, Composition, Preparation and Use**	**15 Hr.**
2.1	Nutrient broth and Nutrient Sugar broth	
2.2	1% & 2% Peptone	
2.3	Glucose Phosphate Broth	
2.4	Urea Broth	
2.5	MacConkey broth	

Reference Books:

Sr. No.	Title/Edition	Authors	Publisher
1	Experimental Microbiology Volume – 1 & 2	Rakesh J. Patel, Kiran R. Patel	Aditya Publication
2	Textbook of Medical Laboratory Technology, 3rd Edition, Volume 1	Praful B. Godkar& Darshan B. Godkar	Bhalani Publishing House Mumbai, India
3	Medical Laboratory Technology - A Procedure Manual for Routine Diagnostic tests, Volume 1/ 2nd Edition	Kanai L. Mukherjee	Tata Mc Graw -Hill Education Private Limited, New Delhi
4	Medical Laboratory Science - Theory and Practice	L. Ochei& A Kolhatkar	Tata Mc Graw -Hill Publishing Limited Company, New Delhi
5	District Laboratory Practice in Tropical Countries, Part 1/ 2nd Edition	Monica Cheesbrough	Cambridge University Press

SEMESTER IV

MLT-SEC-401: LABORATORY MEDIA PREPARATION - 2

Semester: IV	
Course Code	MLT-SEC-401
Course Title	Laboratory Media Preparation - 2
Course Type	Skill Enhancement Course.
Credit	2 (Theory)
Course Level	200-299.
Teaching Hour/ Week	2 hours
Teaching Time	30 hours
Course Objective	To display proficiency in basic microbiological skills.
Course Outcome	At the end of the course, the students will get knowledge of **CO-1:** Different types of Laboratory bacteriological media and its preparation. **CO-2:** Use of various mycological/Fungal media for laboratory purpose.

Mapping between COs and PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1										
CO2										

Course Content:

Unit No.	Content	Teaching Hours
Unit-1	**Bacteriological Media: Principle, Composition, Preparation and Use**	**15 Hr.**
1.1	Nutrient Agar and MacConkey Agar	
1.2	Eosin Methylene Blue Agar and Deoxycholate Citrate Agar	
1.3	Blood Agar and Chocolate Agar	
1.4	Salmonella- Shigella Agar and Wilson and Blair Medium	
1.5	Simmon Citrate Slant, Triple Sugar Ion Slant, Phenyl alanine Slant	
Unit-2	**Mycological Media: Principle, Composition, Preparation and Use**	**15 Hr.**
2.1	Potato Dextrose Agar	
2.2	Rose Bengal Agar	
2.3	Glucose Yeast Extract Agar	
2.4	Sabouraud's Agar	
2.5	Czapek Dox Agar	

Reference Books:

Sr. No.	Title/Edition	Authors	Publisher
1	Experimental Microbiology Volume – 1 & 2	Rakesh J. Patel, Kiran R. Patel	Aditya Publication
2	Textbook of Medical Laboratory Technology, 3rd Edition, Volume 1	Praful B. Godkar& Darshan B. Godkar	Bhalani Publishing House Mumbai, India
3	Medical Laboratory Technology - A Procedure Manual for Routine Diagnostic tests, Volume 1/ 2nd Edition	Kanai L. Mukherjee	Tata Mc Graw -Hill Education Private Limited, New Delhi
4	Medical Laboratory Science - Theory and Practice	M. Ochei & A Kolhatkar	Tata Mc Graw -Hill Publishing Limited Company, New Delhi
5	District Laboratory Practice in Tropical Countries, Part 1/ 2nd Edition	Monica Cheesbrough	Cambridge University Press

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
Multidisciplinary Course Structure of Semester III

Semester & Course Code	Course Title	Credit (Theory)	Teaching duration per Week (in Hr.)	External (Marks) (SEE)	Exam Time Duration (in Hr.)	Internal (Marks) (CCE)	Total (Marks)
III MLT-MDC-301	Introduction to Microbial World	4	4	50	02	50	100

MLT-MDC-301: INTRODUCTION TO MICROBIAL WORLD

Semester: III	
Course Code	MLT-MJ-301
Course Title	Introduction to Microbial World
Course Type	Multidisciplinary
Credit	4 (Theory)
Course Level	200-299
Teaching Hour/ Week	4 Hours
Teaching Time	15×4= 60 Hours
Course Objective	The study aims to provide students with a foundational understanding of microorganisms, their diversity, and their impact on various aspects of life, including human health, the environment, and biotechnology.
Course Outcome	At the end of the course, the students will get knowledge of **CO-1** Microorganisms and their characteristics CO-2 Morphology and economic importance of Eukaryotes (mould, yeast, protozoa) **CO-3** Morphology, cultivation and pathogenic significance of atypical bacteria (Rickettsia, Chlamydia, Mycoplasma, Actinomycetes) **CO-4** General structural properties and types of viruses and bacteriophage

Mapping between COs and PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO-1										
CO-2										

Course Content:

Unit No.	Content	Teaching Hours
Unit-1	**Microbial world and its Identification**	**15 Hr.**
1.1	Origin of microorganisms	

1.2	Medical Microbiology and its development	
1.3	Phenotypic characteristics for microbial identification	
1.4	Genotypic characteristics for microbial identification	
Unit-2	**Eukaryotic Microbes: Morphology and Economic Importance**	**15 Hr.**
2.1	Common features of Eukaryotic cells	
2.2	Molds	
2.3	Yeast	
2.4	Protozoa	
Unit-3	**Atypical bacteria: Morphology, Cultivation and Pathogenic Significance**	**15 Hr.**
3.1	Rickettsia	
3.2	Chlamydia	
3.3	Mycoplasma	
3.4	Actinomycetes	
Unit-4	**Viruses and Bacteriophage**	**15 Hr.**
4.1	General structural properties of Viruses	
4.2	Types of viral infections	
4.3	General Characteristics of Bacteriophage	
4.4	Lytic cycle and Lysogeny	

Reference Books:

Sr. No.	Title/Edition	Authors	Publisher
1.	Elementary Microbiology, Fundamentals of Microbiology, Vol-1	Modi H.A.	Ekta Prakashan
2.	Prescott's Microbiology /8th	J. M. Willey, L. M. Sherwood, C. J. Woolverton,	McGrowHill, International Edition
3.	Nester's Microbiology, International Edition,	Nester Anderson, Roberts, Pearsall	McGrow HillPub.