Undergraduate Qualifications

B.Voc in Medical Laboratory Technology

As per guidelines of the National Higher Education Qualification Framework (NHEQF)

Year	Qualification Title	NCrF Level
Year-1	Undergraduate Certificate in Medical Laboratory Technology	Level4.5
Year-2	Undergraduate Diploma in Medical Laboratory Technology	Level5
Year-3	Bachelor of Vocation in Medical Laboratory Technology	Level5.5

School of Health Science and Technology

(Academic Year: 2025- 2026)

Program Overview

Medical Laboratory Technology (MLT) is a vital healthcare field that focuses on the analysis of biological samples to aid in disease diagnosis, treatment, and prevention. Medical Laboratory Technologists play a crucial role in modern medicine by conducting tests on blood, urine, tissues, and other body fluids to provide accurate diagnostic data for physicians and healthcare professionals. Their work helps in detecting infections, monitoring chronic diseases, identifying genetic disorders, and even diagnosing conditions like cancer. The MLT program is designed to equip students with the necessary scientific knowledge, technical expertise, and practical skills to perform laboratory procedures efficiently and accurately.

The curriculum covers core subjects such as human anatomy and physiology, microbiology, hematology, clinical biochemistry, immunology, and histopathology. Students receive hands-on training in laboratory techniques, including sample collection, microscopic analysis, and the use of advanced diagnostic instruments such as spectrophotometers, automated analyzers, and centrifuges. Emphasis is placed on laboratory safety, quality control, and ethical practices to ensure accurate and reliable test results. The program also integrates clinical internships or practical sessions in hospitals and diagnostic centers, allowing students to gain real-world experience in a professional laboratory setting.

Scope:

1. **Employment in Clinical and Diagnostic Laboratories**
   Graduates can work as medical lab technologists in hospitals, diagnostic labs, pathology labs, and blood banks, performing tests on blood, urine, tissues, and other samples.
2. **Vital Role in Disease Diagnosis**
   MLT professionals assist doctors by conducting biochemical, microbiological, hematological, and immunological tests that are crucial for accurate diagnosis and treatment.
3. **Opportunities in Research and Pharmaceutical Labs**
   There's scope for working in clinical research organizations (CROs), pharmaceutical companies, and public health laboratories engaged in disease research and drug development.
4. **Higher Education and Specialization**
   Graduates can pursue M.Voc, M.Sc. in MLT or specialized diplomas in microbiology, clinical pathology, hematology, or molecular diagnostics.
5. **Teaching and Academic Roles**
   With experience and further qualifications, individuals can work as lab instructors, educators, or academic coordinators in paramedical and vocational training institutions.

Career Path:

Entry-Level

1. Laboratory Technician
2. Phlebotomist
3. Sample Collection Assistant
4. Pathology Lab Assistant
5. Clinical Lab Assistant

Mid-Level

1. Senior Laboratory Technician
2. Medical Lab In-charge
3. Quality Control Technician
4. Blood Bank Technician
5. Pathology Technician

Senior-Level

1. Technical Officer – Laboratory Services
2. Laboratory Quality Assurance Officer
3. Laboratory Training Faculty
4. Diagnostic Laboratory Consultant

.

Program Learning Outcomes

Program Specific Outcomes	
	A Graduate of B.Voc in Medical Laboratory Technology should be able to:
PSO1	Demonstrate the acquisition of comprehensive knowledge and coherent understanding of healthcare in a broad multidisciplinary context, their different learning areas, their linkages with related fields of study, and current and emerging developments associated with the industry.
PSO2	Demonstrate the acquisition of practical, professional, and procedural knowledge required for carrying out professional or highly skilled work/tasks related to healthcare including knowledge required for undertaking self-employment initiatives, and knowledge and mind-set required for entrepreneurship involving enterprise creation, improved product development, or a new mode of organization.
PSO3	Demonstrate the acquisition of skills in areas related to specialization in healthcare in a broad multidisciplinary context, including wide-ranging practical skills, involving variable routine and non-routine contexts relating to the medical laboratory technology.
PSO4	Demonstrate the acquisition of the capacity to extrapolate from what has been learned, translate concepts to real-life situations and apply acquired competencies in new/unfamiliar contexts, rather than merely replicate curriculum content knowledge, to generate solutions to specific problems.

Generic Program Outcomes	
	A graduate of B.Voc in Medical Laboratory Technology should be able to:
	Demonstrate the capability for complex problem-solving
PO6	Demonstrate the capability for critical thinking
PO7	Demonstrate the ability for creativity
PO8	Demonstrate the skills that enable them to communicate effectively
PO9	Demonstrate the capability for analytical reasoning/thinking
PO10	Demonstrate the ability for coordinating and collaborating with others
PO11	Demonstrate the capability for leadership readiness
PO12	Demonstrate 'learning how to learn" skills
PO13	Demonstrate the capability for digital and technological skills
PO14	Demonstrate multicultural competence and inclusive spirit
PO15	Demonstrate the acquisition of knowledge and attitude that are required for value inculcation
PO16	Demonstrate the ability for autonomy, responsibility, and accountability
PO17	Demonstrate the acquisition of and ability to apply the knowledge, skills, attitudes, and values required to take appropriate actions for environmental awareness and action
PO18	Demonstrate the capability to participate in community-engaged services/ activities for promoting the wellbeing of society.
PO19	Demonstrate the ability to identify with or understand the perspective, experiences, or points of view of another individual or group, and to identify and understand other people's emotions

Abbreviation And Definition

Abbreviation	Definition
MDP	Multidisciplinary
AEC	Ability Enhancement Courses
VAC	Value Added Courses
SEC	Skill Enhancement Courses
MC	Major (Core)
MD	Major (Discipline)
MIP	Major (Industry Practice)
VETI	Vet (Industry Immersion)
MI	Minor (Electives)

Semester Wise Structure and Curriculum

UG Certificate in Medical Laboratory Technology | NCrF – 4.5

Semester-1							
	Course Title	**Category**	**L**	**P**	**Pr**	**Credits**	
	Human Anatomy and Physiology	MC-1	0	3	0	3	
	Basics of Biochemistry	MC-2	0	3	0	3	
	Concept of Health and Hospital Services	MDP-1	3	0	0	3	
	Professional Skills (Team Skills)	SEC-1	3	0	0	3	
	On the Job Training – 1	MIP	0	0	8	8	
	Total		**6**	**6**	**8**	**20**	

Semester-2							
	Course Title	**Category**	**L**	**P**	**Pr**	**Credits**	
	Microbiology	MC-3	0	3	0	3	
	Haematology	MC-4	0	3	0	3	
	Fundamentals of Business	MDP-2	3	0	0	3	
	Employability Skills (Basics)	SEC-2	3	0	0	3	
	On the Job Training-2	MIP	0	0	8	8	
	Total		**6**	**6**	**8**	**20**	

UG Diploma in Medical Laboratory Technology | NCrF – 5.0

Semester-3							
	Course Title	**Category**	**L**	**P**	**Pr**	**Credits**	
	Immunohematology and Blood Transfusion	MC-5	0	3	0	3	
	Immunology and Serology	MC-6	3	0	0	3	
	Systematic Bacteriology	MC-8	0	3	0	3	
	Environmental Sciences	MDP-3	3	0	0	3	
	Communication Skills (English)	AEC-1	0	4	0	4	
	On the Job Training – 3	MIP	0	0	8	8	
	Total		**6**	**10**	**8**	**24**	

Semester-4							
	Course Title	**Category**	**L**	**P**	**Pr**	**Credits**	
	Histopathology and Cytology	MC-7	0	3	0	3	
	Clinical Virology and Mycology	MC-8	0	3	0	3	
	Cultural Diversity in the Indian Society	VAC-1	3	0	0	3	
	Professional Skills (Career Skills)	SEC-3	3	0	0	3	
	On the Job Training – 4	MIP	0	0	8	8	
	Total		**6**	**6**	**8**	**20**	

UG degree in Medical Laboratory Technology | NCrF – 5.5

Semester-5							
	Course Title	**Category**	**L**	**P**	**Pr**	**Credits**	
	Routine and Special Diagnostic Tests	MC-9	0	3	0	3	
	Pathophysiology and disease diagnosis	MC-10	0	3	0	3	
	Hospital Administration	MI-1	3	0	0	3	
	Research Methodology and Biostatistics	MI-2	3	0	0	3	
	Business Communication	AEC -2	0	4	0	4	
	On the Job Training –5	MIP	0	0	8	8	
	Total		**6**	**10**	**8**	**24**	

Semester-6							
	Course Title	**Category**	**L**	**P**	**Pr**	**Credits**	
	Biomedical Waste Management	MI 3	3	0	0	3	
	Lab Operation and Safety Process	MI 4	3	0	0	3	
	Universal Human Values	VAC-2	3	0	0	3	
	On the Job Training –6	MIP	0	0	12	12	
	Total		**9**	**0**	**12**	**21**	

Curriculum (Course-wise)

Semester I

Course Code	MC1	Course Name	Human Anatomy and Physiology	Course Category	MC	Major	L	P	Pr	C
							0	3	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	Recall the basic structures and functions of major organs and systems in the human body.	1
CLO2	Explain the relationship between the structure and function of organ systems.	2
CLO3	Apply knowledge of anatomy and physiology to describe physiological processes.	3
CLO4	Analyze the interrelationships between organ systems in maintaining health.	4
CLO5	Evaluate the impact of anatomical or physiological dysfunctions on health.	5

Module 1: Human anatomy and physiology

Introduction to anatomy and physiology - Definition, difference between structures and functions. Different terms used in anatomy. Levels of body organization Characteristics of the living human organism – Eleven systems of the human body and its associated organs. Scopes of human anatomy and physiology-Scopes and career prospects, branches and divisions.

Module 2: Cell, tissue, bones and skeletal muscular system

Organization of the human body- Cell, cellular organelles, structures and functions, Cell division processes. Types of tissues, their structure and functions. Skeletal system- structure and function of different bones and joints, skeletal system of humans, position of bones and skeletons. Muscular system- Structure, composition, and functions of different muscles and their positions.

Module 3: Blood, Lymph, Circulatory and Cardiovascular system

Blood- Structure, composition, functions, synthesis processes, mechanism, and normal ranges of blood and blood components. Lymphatic system- composition and circulation process of lymph, structure and functions of different associated organs of the lymphatic system. Cardiovascular system- Structure, position, and functions of the heart, veins, and arterial supplies, different blood circulation systems, cardiac output, and cardiac cycle.

Module 4: Respiratory, Urinary and Digestion system

Respiratory System- identifying different organs, their structure, position, and functions involved in the respiratory system, respiratory mechanism, lungs capacity. Urinary System- structure and function of organs of the urinary system, urine composition, mechanism of urination, filtration,

and storage process. Digestion System- structure and functions of organs involved in the digestion process, their metabolic activity, associated organs of digestion and their structure and functions.

Module 5: Endocrine, Nervous system and Reproductive system

Endocrine Glands- definition of endocrine glands, their classification, structural, functional descriptions of each gland, and their hormones. Nervous System – Description of the brain, spinal cord, and a complex network of nerves, understanding of the central nervous system and peripheral nervous system. Sensory Nervous System- Understanding the sensory system, organs of the sensory system, their structure and function. Reproductive system- Understanding the both male and female reproductive organs, their structures, secretions, and functions.

Suggested Readings

1. "Human Anatomy and Physiology" by Elaine N. Marieband Katja Hoehn
2. "Anatomy and Physiology: The Unity of Form and Function" by Kenneth S. Saladin
3. "Essentials of Human Anatomy and Physiology" by Elaine N. Marieb
4. "Human Anatomy and Physiology" by Stuart Fox
5. "Anatomy and Physiology for Health Professionals" by J. L. H. Asimov

Course Code	MC3	Course Name	Basics of Biochemistry	Course Category	Skill	Major	L	P	Pr	C
							0	3	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	Recall and define the basic terminology, concepts, and principles in biochemistry, including the structure and function of biomolecules such as proteins, carbohydrates, lipids, and nucleic acids.	1
CLO2	Explain the biochemical pathways involved in energy production and metabolism, including glycolysis, the citric acid cycle, and oxidative phosphorylation.	2
CLO3	Apply the principles of enzyme kinetics to analyze enzyme behavior and understand their role in biochemical reactions.	3
CLO 4	Analyze and differentiate between various biochemical techniques (e.g., chromatography, electrophoresis) used for the separation and identification of biomolecules.	4
CLO5	Evaluate the role of biochemistry in human health and disease, and synthesize knowledge to understand how biochemical imbalances can lead to various medical conditions.	5

Module 1: Essentials of Biochemistry

Introduction to biochemistry: Importance and scope in medicine – Definition, different medical abbreviations, chemical reagents, equipment, and instruments used in biochemistry laboratory, Language of Biochemistry- Concepts, terminologies, and introduction to essentials of biochemistry., Laboratory Techniques and Instruments in Biochemistry- Different instruments, techniques, and chemicals used in biochemical studies.

Module 2: Nutrients in the human body

Introduction to Macronutrients: Classification and Biological Significance of various macronutrients involved in biological processes., Metabolic processes of macronutrients: Metabolic process of all macronutrients in the human body and study of their inter-relation, Introduction to Micronutrients: Classification and biological significance of various micronutrients involved in biological processes, Water-the nectar of life: Role of water in metabolism and different regulatory processes in the human body, Metabolism: Activities and fate of metabolic products.

Module 3: Enzymes and co-enzymes

Enzymes: Introduction and classification: Introduction to enzymes and co-enzymes, their types and classification, enzyme-substrate complex., Factors affecting enzymatic activities: Effect of pH and Temperature in enzyme activity, Substrate Concentration and Enzyme Kinetics, Enzyme Inhibition, Enzymes in Clinical Diagnostics.

Module 4: Introduction to Nucleic Acids

Nucleic acids-structure and functions: Introduction to different nucleic acids, structure of DNA and RNAs, Double helix structure, Concepts of complementary base pairs. DNA replication and Protein synthesis, Mutation of nucleic acids- types and significance: Types of mutations, Replication errors, DNA damage agents, Impact of mutations on protein function, Functional consequences of mutations, Significance in medical diagnosis, Application of Nucleic acid- Applications of nucleic acid in diagnostic and therapeutic treatment processes.

Module 5: Metabolic Disorders and human health

Metabolic disorders in the human body: Common biochemical pathways affected in metabolic disorders, Identification and causes of disorders, Symptoms and clinical presentation, Diagnostic approaches and techniques, Treatment and management strategies, Ethical and social considerations.

Suggested readings

1. "Principles of Biochemistry" by Albert Lehninger
2. "Biochemistry" by Jeremy M. Berg, John L. Tymoczko, and Lubert Stryer
3. "Biochemistry: A Short Course" by John L. Tymoczko, Jeremy M. Berg
4. "Essential Biochemistry" by Charlotte W. Pratt and Kathleen Cornely
5. "Biochemistry for Dummies" by John T. Moore

Course Code		**Course Name**	Concept of Health and Hospital Services	**Course Category**	MDP		L	P	Pr	C
							3	0	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	Define key concepts related to health, well-being, and hospital services.	1
CLO2	Explain the structure and functions of health care delivery systems in India and globally.	2
CLO3	Analyze real-life scenarios to identify the roles and responsibilities of various hospital departments.	3
CLO4	Compare and contrast different types of health care services (public vs. private) and their impacts on patient care.	4
CLO5	Develop a health promotion program or intervention plan for a specific community based on health needs assessment.	5

Module 1: Concept of Health and Well-being

Definition and Dimensions of Health (Physical, Mental, Social, Spiritual, Emotional), Determinants of Health: Biological, Environmental, Behavioral, Social, Economic, Concepts of Disease and Illness Acute vs. Chronic, Infectious vs. Non-infectious, Indicators of Health – Mortality rate, Morbidity rate, Life expectancy, DALY, Concepts of Well-being and Quality of Life, Changing concepts of health Biomedical, Ecological, Psychosocial, Holistic, Role of lifestyle and behavior in health maintenance

Module 2: Health Care Delivery System in India

Overview of Health Care System in India, Levels of Health Care: Primary, Secondary, Tertiary, Functions and Services at Each Level, Role of Government in Health Care – MOHFW, NRHM/NHM, Public Health Infrastructure: Sub-centers, PHCs, CHCs, District Hospitals, Role of Private Sector, Voluntary Organizations, and NGOs, Indigenous Systems of Medicine (AYUSH), Recent Initiatives: Ayushman Bharat, Digital Health Mission

Module 3: Hospital Services and Administration

Definition, Aims, and Classification of Hospitals, Functions of Hospitals – Curative, Preventive, Educational, Research, Types of Hospitals – General, Specialty, Teaching, Rural, Urban, Hospital Departments OPD, IPD, ICU, Emergency, Operation Theatre, Pharmacy, Radiology, Laboratory, Hospital Administration – Organizational Structure, Duties of Hospital Administrator, Human Resource Management in Hospitals, Equipment and Material Management, Legal Aspects: Medical Ethics, Consumer Protection Act, Medical Negligence

Module 4: Community Health and Preventive Services

Definition and Importance of Community Health, Principles and Levels of Prevention: Primary, Secondary, Tertiary, Role of Community Health Workers – ASHA, ANM, MPW, Immunization Programs and National Health Campaigns, Water Supply, Sanitation, Waste Disposal in Health,

Nutrition and Health – Community Nutrition Programs, Health Education and IEC (Information, Education, Communication), Maternal and Child Health (MCH) and Reproductive Health Services

Module 5: Health Planning, Policies, and Global Health

Health Planning in India – Five Year Plans and Health Goals, National Health Policy – Evolution and Objectives, Health Committees: Bhore, Mudaliar, Shrivastava, Role of International Health Agencies WHO, UNICEF, Red Cross, UNDP, World Bank, Global Health Issues – Pandemics, Malnutrition, Access to Care, Sustainable Development Goals (SDGs) and Health, Health Economics Cost of Health Care, Financing, Insurance, Role of Health Information Systems and Surveillance

Suggested Readings

1. Principles of Hospital Administration and Planning – Dr. B.M. Sakharkar
2. Hospital Administration – C.M. Francis & Mario C. deSouza
3. Essentials of Hospital Management & Administration – Yashpal Bhatia
4. Textbook of Hospital Administration – D. C. Joshi & Mamta Joshi
5. Hospital and Health Services Administration – S.L. Goel
6. Hospital Management – G.D. Kunders

Course Code	SEC1	Course Name	Professional Skills (Team Skills)	Course Category	General	SEC	L	P	Pr	C
							3	0	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	Explain the importance of team skills and list the key team skills	2
CLO2	Apply cognitive skills such as critical thinking, problem-solving and the ability to learn, for smooth and efficient functioning in the workplace	3
CLO3	Apply non-cognitive skills such as empathy, creativity, teamwork, collaboration, interpersonal skills, and resilience for smooth and efficient functioning in the workplace	3
CLO4	Use trust and collaboration while working in a team	3
CLO5	Display effective communication as team leaders and members for the proper functioning of the team	3

Module 1: **Communication Basics**
Communication: Basics and Importance, Speaking: Greetings and Introductions, Writing: Understand Personal Experiences and Thoughts, Non-verbal Communication, Active Listening, Negotiation, Self-Presentation, Self-Presentation: Excelling at Interviews, Self-Presentation: Rocking the Group Discussion, Selling

Module 2: **Communication Workplace**
Speaking: On the Telephone, Speaking: Making Requests, Writing: Write Effective Notes, Writing: Write Effective Emails, Negotiation: Negotiation in Action Getting to YES

Module 3: **Teamwork**
Work Effectively in a Team, Collaborate to Achieve Team Goals, Build Effective Relationships with Stakeholders, Conflict Management,

Module 4: **Customer Centricity**
Types of Customers, Responding Effectively to Customers,

Module 5: **Attitudes and Behavioural Skills**
Time and task management, Quality consciousness, Result Orientation, Self-Development - Positive Attitude, Self-Awareness: Know Yourself, Responding to Change, Personal Health, Hygiene, and Grooming, Adopting safety practices, Gain Financial Literacy

Module 6: **Problem Solving:**

Introduction to Critical Thinking, Problem Solving: Introduction to Creative Thinking, Problem-Solving: Introduction to Decision Making, Decision Making: Respond Effectively to a Situation,

Module 7: **Workplace Awareness**

Cultural Fitment and Gender Diversity, Identify and Align with High-growth Sectors, Organisational Structure and Values, Searching and Applying for Relevant Job,

Module 8: Success in Job Interviews

How to Prepare for a Job Interview, How to Prepare for Job Interview - Getting Ready, How to Conduct Yourself at the Venue, How to Answer Questions During the Interview, How to Effectively Conclude the Interview, How to follow up after the Interview, Ace your Job Interview.

Suggested Readings

1. "The Five Dysfunctions of a Team" by Patrick Lencioni
2. "Team of Teams" by General Stanley McChrystal
3. "The Five Behaviors of a Cohesive Team" by Patrick Lencioni
4. "The New Science of Building Great Teams" by Michael A. West
5. "First, Break All the Rules" by Marcus Buckingham and Curt Coffman

Semester II

Course Code		Course Name	Microbiology	Course Category	Skill	Major	L	P	Pr	C
							0	3	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	Recall the basic principles of microbiology, including types of microorganisms and their characteristics.	1
CLO2	Explain the role of microorganisms in human health, including pathogenic and beneficial microbes.	2
CLO3	Apply microbiological techniques to identify and classify microorganisms in clinical and laboratory settings.	3
CLO4	Analyze the mechanisms of microbial infections and their impact on human health.	4
CLO5	Evaluate the effectiveness of antimicrobial treatments and infection control practices in preventing disease spread	5

Module 1: Introduction to Microbiology:

Understanding the role of microbiology in healthcare, Overview of microorganisms (bacteria, viruses, fungi, protozoa), The classification of microorganisms, Importance of microbiology in infectious disease diagnosis and treatment, Techniques used in microbiological research and clinical practice, Historical development of microbiology and key pioneers (e.g., Louis Pasteur, Robert Koch).

Module 2: Microbial Structure and Function:

The structure and function of prokaryotic and eukaryotic cells, Bacterial cell components (cell wall, cell membrane, flagella, pili), Viruses and their structure (capsid, envelope, genetic material), Fungi and protozoa characteristics, The life cycle of bacteria, viruses, fungi, and protozoa, The role of microbial structures in pathogenicity.

Module 3: Microbial Genetics and Evolution:

Introduction to microbial genetics and genetic material, DNA replication, transcription, and translation in microorganisms, Genetic recombination in bacteria (transformation, transduction, conjugation), Mutation and its role in microbial evolution, Antibiotic resistance and its genetic mechanisms, The impact of microbial genetics on infection control and treatment.

Module 4: Microbial Pathogenesis and Host Defense Mechanisms:

Mechanisms of microbial pathogenicity (adherence, invasion, toxin production), The immune response to microbial infections (innate and adaptive immunity), The role of inflammation in infection, The concept of virulence factors and their role in infection severity, Host defense mechanisms (phagocytosis, antibodies), Pathogenesis of common infectious diseases (e.g., tuberculosis, malaria, influenza).

Module 5: Microbial Cultivation, Identification, and Control:

Techniques for cultivating microorganisms in the laboratory (agar plates, broths, selective media), Methods of identifying microorganisms (gram staining, biochemical tests, molecular techniques), Antimicrobial susceptibility testing, Principles of sterilization and disinfection, Infection control practices in healthcare settings (hand hygiene, isolation protocols), Vaccination and its role in infection prevention.

Module 6: Clinical Microbiology and Disease Diagnosis:

Overview of clinical microbiology in diagnostic settings, Collection and transport of clinical samples (blood, urine, sputum, etc.), Techniques for isolating pathogens from clinical specimens, Interpretation of microbiological test results, The role of microbiology in diagnosing common infections (e.g., urinary tract infections, respiratory infections, foodborne diseases), The importance of antimicrobial stewardship in clinical practice.

Suggested Readings

1. "Microbiology: A Systems Approach" by Marjorie Kelly Cowan
2. "Microbiology: Principles and Explorations" by Jacquelyn G. Black
3. "Brock Biology of Microorganisms" by Michael T. Madigan
4. "Medical Microbiology" by Patrick R. Murray

Course Code	MC5	Course Name	Haematology	Course Category	MC	Major	L	P	Pr	C
							0	3	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	Recall that haematology is the study of blood, blood-forming tissues, and disorders related to blood, such as anemia, leukemia, and clotting disorders.	1
CLO2	Explain how blood components, including red blood cells, white blood cells, platelets, and plasma, each play a specific role in maintaining health and fighting infections.	2
CLO3	Apply haematology principles by demonstrating how blood tests, such as a complete blood count (CBC), help diagnose various blood disorders or monitor treatment progress.	3
CLO4	Analyze how understanding the functions of blood cells and clotting factors is essential for managing conditions like bleeding disorders or blood cancers.	4
CLO5	Evaluate how undiagnosed blood disorders, such as sickle cell anemia or thrombocytopenia, can lead to severe health complications if not properly treated.	5

Module 1: Introduction to Haematology

Understanding of haematology: Definition, scope, importance and utility in medical science, Orientation of lab: Equipment and its specific utility, reagents, compositions, QC and utilization

Module 2: Blood components and its synthesis process

Blood Formation and compositions- synthesis of blood and blood components, normal structure and functions, Erythrocytes- formation, morphology and function of red blood cells, Leukocytes- Formation, types, function, life span and Morphology, Platelets- Formation, morphology and function, Bone marrow- Positions, structure, function and aspiration

Module 3: Phlebotomy and Anticoagulants

Phlebotomy- Types of blood Collection like Capillary, Venous and atrial collection sites of blood collection, Anticoagulants: Preservation of blood, Natural and Artificial anticoagulants, colour codes and test performed

Module 4: Haematological abnormalities

Anaemia- Definition, morphology and etiological classification, Microcytic hypochromic anemia, causes, types and laboratory investigation, Sickle cell anemia, Thalassemia, Genetic disorders, Leukemia, Lymphoma and Myeloma, Bleeding disorders- Haemostasis and coagulation,

Haemophilia, Blood clotting disorder, DIC, Fibrolysis, Hyper fibrolysis, Von Willebrand disease, Idopathic Thrombocytopenic Purpura

Module 5: Advance tools and Techniques

Automation technique: Different advance techniques used in haematology, Mechanism, advantages and disadvantages, Haematological Analyzers: Electrical impedance, Flow cytometry, and Fluorescent Flow Cytometry.

Suggested readings

1. "Hematology: Basic Principles and Practice" by Ronald Hoffman
2. "Essential Hematology" by A. Victor Hoffbrand
3. "Clinical Hematology: Theory and Procedures" by Mary Louise Turgeon
4. "Hematology: A Textbook of Hematologic Medicine" by Michael L. Steinberg
5. Color Atlas of Hematology" by A. N. Bolognese

Course Code	MDP 2	Course Name	Fundamentals of Business	Course Category	General	MDP	L	P	Pr	C
							3	0	0	3
Pre-requisite			Nil	Co-requisite		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	Describe various business forms, their advantages, legal requirements, and the registration process for establishing a business	2
CLO2	Describe the nature and significance of business economics and its role in informed decision-making	2
CLO3	Explain the principles and necessity of business ethics and the concept and importance of social responsibility	2
CLO4	Describe the concepts and processes of management, planning, organizing, directing, controlling, and the traits and styles of effective leadership	2
CLO5	Identify various organizational structures and explain their advantages	1

Module 1: **Introduction to Business**
Different Types of Business Forms, What is Business?, Types of Business, Advantages of different business forms, Legal requirements for establishing different businesses, Registration process of a business, Steps involved, Necessary documents, Importance, Costs associated, Government agencies, Benefits, Common mistakes to avoid.

Module 2: **Economics and Business**
Nature and Significance, Meaning of business economics, Nature, Role of business economics in decision-making, Fundamentals, Cost-benefit analysis, Demand and supply analysis, Pricing strategies, Economic forecasting, External factors affecting business decisions.

Module 3: Ethics and Social Responsibility
Need of Business Ethics, Meaning, Principles, Need, Concept of Social Responsibility Need, Meaning, Need.

Module 4: **Management and Leadership**
Concept of management, Process, Nature, Importance, Scope, Planning, Importance, Characteristics, Process, Types of Plans, Organising, Concept, Steps, Principles, Importance, Directing and Controlling, Concept, Principles, Elements and Importance, Controlling and its Features, Importance and Process of Controlling, Leadership, Concept, Meaning, Effective Leadership Traits, Leadership Styles.

Module 5: **Organizational Structure**
Types and advantages of different types of organizational structure, Organisational Structure, Types, Choosing the right type of organizational structure, Necessity, Right structure and Growth, Stages in

Organisational Development, Organisational Developmental Strategy, Organisational Practices in 5 phases of growth, Organisational success.

Suggested Readings

1. Robbins and Cotran Pathologic Basis of Disease" by Kumar, Abbas, and Aster
2. "Clinical Pathology" by David L. Stoeckle
3. "Essential Pathology" by Alan B. Weerasinghe
4. "Clinical Laboratory Science: The Basics and Routine Techniques" by Mary Louise Turgeon
5. "Pathology: Implications for the Physical Therapist" by Catherine C. Goodman

Course Code	SEC 2	Course Name	Employability Skills (Basics)	Course Category	General	SEC	L	P	Pr	C
							3	0	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	Demonstrate proficiency in various forms of communication to achieve desired outcomes in personal and professional interactions	3
CLO2	Demonstrate proficiency in workplace communication skills and negotiation techniques for efficient and productive communication within the workplace	3
CLO3	Describe teamwork dynamics within the team environment	2
CLO4	Identify different types of customers and effectively respond to their needs and inquiries, fostering a customer-centric approach	1
CLO5	Demonstrate personal and professional competencies for personal growth, organizational success, and overall well-being	3
CLO6	Demonstrate critical thinking, creative thinking, and decision-making skills to respond effectively to a variety of situations	3
CLO7	Demonstrate an understanding of cultural and gender diversity in the workplace to foster a culture of inclusivity and collaboration.	3
CLO8	Prepare for job interviews, including readiness, conclusion strategies, and post-interview follow-up, to excel in job interviews.	3

Module 1: Communication Basics

Communication: Basics and Importance, Definition, Importance, Improving communication skills for better personal and professional relationships, Speaking: Greetings and Introductions, Conversations, Types of conversations, WORDS approach, Writing: Understand Personal Experiences and Thoughts, How to write a paragraph, CRAFT approach, Non-verbal Communication, Definition, Importance, Improving non-verbal communication, Active Listening, Definition, RESPECT approach, Negotiation: Understanding Perspectives, Definition, OPEN approach, Self-Presentation: Making a Great First Impression, APPEAR approach, Self-Presentation: Excelling at Interviews, What do recruiters look for?, PERFECT approach, Self-Presentation: Rocking the Group Discussion, Definition of group discussion, PITCH approach, Selling: Communicate Effectively to Gain Acceptance, Communication methods to gain acceptance for product, service, idea, ACCEPT approach.

Module2: Communication at Workplace

Speaking: On the Telephone, Everyday communications, Ways to communicate politely and effectively on the telephone, WORDS approach, Speaking: Making Requests, Ways to request politely, The difference between permission and request, WORDS approach, Writing: Write Effective Notes, Definition of note-taking, Effectively writing notes, Organising notes, PILOT approach,

Cornell method of note-taking, Writing: Write Effective Emails, Importance, The difference between written and verbal communication, PILOT approach, Negotiation: Negotiation in Action Getting to YES, Types of outcomes, GAINS approach.

Module 3: **Teamwork**,
Work Effectively in a Team, Importance of working in a team, CAUSE model, Collaborate to Achieve Team Goals, Importance, Identifying goals, SUCCESS model, Build Effective Relationships with Stakeholders, What is a stakeholder?, Types of stakeholders, TREAT technique for managing stakeholders, Conflict Management: Identify and Resolve Conflicts, Reasons for conflicts, Techniques to resolve conflicts, CALM approach.

Module 4: **Customer Centricity**
Types of Customers, Potential, Past, Current, Types of personalities (OCEAN), Responding Effectively to Customers, Importance, LAST approach.

Module 5: **Attitudes and Behavioural Skills**
Time and task management: Plan and Manage Tasks Within a Timeline, Time management definition, Planning and managing tasks, Staying organized, PLOT approach, Time and task management: Plan, Prioritise, and Manage Tasks, Managing time, Organizing and prioritizing tasks, TRAIN model, Quality consciousness: Introduction to Quality, Defining quality consciousness, The importance of establishing standards, Quality Consciousness: Understand the Impact of Errors, Defining errors, The impact of errors, Avoiding mistakes, Result Orientation: Introduction to Result Orientation, Defining result orientation, The importance of a result-oriented mindset, How to succeed and get desired results?, Result Orientation: Plan Tasks to Achieve Goals, Becoming result-oriented, Result orientation process, Self-Development - Positive Attitude, Defining attitude, The importance of positive mindset, GLAD model, Self-Awareness: Know Yourself, Defining self-awareness, Identifying strengths, Interests and areas of improvement, Using strengths to achieve goals, Responding to Change: Understand and Adjust to Change, Defining change, Reacting to change, Ways to adapt to change, Personal Health, Hygiene, and Grooming, The importance of grooming, Importance of personal hygiene, Grooming essentials, Effects of not maintaining appearance, Adopting safety practices: Health, Environment, and Safety Awareness, Ways to stay fit and healthy, Keeping surroundings clean, Keeping yourself safe, PASS technique for fire extinguishers, Gain Financial Literacy, Importance of financial literacy, Financial tools in daily life, Components of salary, Types of bank accounts, Importance of insurance.

Module6: Problem Solving
Problem Solving: Introduction to Critical Thinking, Importance of critical thinking, Applications, Analysing problems, Link between ideas, REASON model, Problem Solving: Introduction to Creative Thinking, Defining creative thinking, Importance, Applications, Problem-Solving: Introduction to Decision Making, Defining decision making, Importance, Elements of decision making, Decision Making: Respond Effectively to a Situation, Decision-making process, Application in different scenarios, DECIDE model.

Module7: Workplace Awareness
Cultural Fitment and Gender Diversity, Stereotyping and unconscious bias, Diversity issues and how to resolve them, Features of a diverse workplace, Behavioural elements of a diverse workplace, Identify and Align with High-growth Sectors, Types of skill sets, Steps before applying for a job, Organisational Structure and Values, Organizational structure and hierarchy, Organizational values,

Work environment and culture, Searching and Applying for Relevant Job, Platforms for finding job vacancies, Creating a resume, Cover letter formats, Job application requirements.

Module8: Success in Job Interviews

How to Prepare for a Job Interview - Gaining Confidence, Describing strengths and qualities, Do's and Don'ts for identifying strengths, Researching roles and responsibilities, Knowing your resume, The importance of knowing about the company, Asking questions to the interviewer, How to Prepare for Job Interview - Getting Ready, List of documents for the interview, Behaviour at the interview venue, Grooming and appearance for the interview, How to Conduct Yourself at the Venue, How to make a good first impression, Tips for conducting yourself well at the venue, How to Answer Questions During the Interview, Making a good impression, Tips to answer questions effectively, How to Effectively Conclude the Interview, Asking relevant questions to the interviewer, How to follow up after the Interview, Following up to know the application status, Accepting the job offer, Handling negative results, Ace your Job Interview, Identify and describe your strengths and weaknesses, Updating resume, Mock interviews, Tricks to do well in an interview.

Suggested Readings

1. "Employability Skills" by Christine Lockwood
2. "The 7 Habits of Highly Effective People" by Stephen Covey
3. "Essential Skills for Business Success" by R. Glenn
4. "The Employability Skills Handbook" by Carol Dixon
5. "How to Get a Job: The Ultimate Guide to Finding a Job" by K. McGregor

Semester III

Course Code		**Course Name**	Immunohematology and Blood Transfusion	**Course Category**	MC	Major	L	P	Pr	C
							0	3	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	List the major blood group systems, including ABO, Rh, and rare subgroups such as Bombay, and recall the structure of red cell membranes.	1
CLO2	Describe the principles of blood collection, storage, component separation, and pre-transfusion testing including Coombs test, Du test, and HLA typing.	2
CLO3	Demonstrate the procedures for donor selection, safe blood transfusion, and investigation of transfusion reactions like erythroblastosis fetalis.	3
CLO4	Differentiate between various types of transfusion reactions and analyze compatibility test results to ensure safe transfusion practices.	4
CLO5	Evaluate the effectiveness of blood bank operations, quality control measures, and modern advancements such as automation, artificial blood, and cord blood banking.	5

Module 1: Immunohematology and Blood Transfusion
History and introduction to blood group systems, ABO blood group system, Rh system, Blood group antigens and antibodies, Subgroups including the Bombay group, Red cell membrane structure.

Module 2: Phlebotomy, Blood Storage, and Pre-transfusion Testing
Blood bags, Preservatives and storage, Donor selection criteria, Blood collection procedure, Component separation, Cryoprecipitate, Screening of blood, Pre-transfusion testing including blood grouping, Typing, Compatibility testing, Coombs test, Du test, HLA typing.

Module 3: Blood Transfusion and Artificial Blood
Indications and types of blood transfusion, Apheresis, Transfusion reactions, Erythroblastosis fetalis, Investigation of transfusion reactions, Clinical trials, Blood substitutes, Uses of artificial blood.

Module 4: Blood Banking and Advances in Transfusion Medicine
Organization and operation of blood bank, Administration of blood donation camps, Quality control in blood banking, Advances in transfusion medicine including cord blood bank, Automation, Blood collection machines

References and Suggested Readings

1. J Ochei and A Kolhatkar, Medical Laboratory Science- Theory and Practice, 1st Edition 2000, Tata Mcgraw Hill Publishing Co Ltd.

2. Praful B. Godkar, Darshan P. Godkar, Text book of Medical Laboratory Technology, 3rd Edition 2014, Bhalani Publishing House.
3. R N Makroo, Principle andPractice of transfussion medicine, 1st Edition 2014, Jain Books.
4. Christopher D Hillyer, Beth, James, Transfusion Medicine and hemostasis: Clinical and Laboratory aspect, 2ndEdition 2013, Elsevier Healths.
5. Richard A. McPherson, Henry's Clinical Diagnosis and Management by Laboratory Methods, 22nd Edition 2014, Elsevier.

Course Code	MC 7	Course Name	Immunology and Serology	Course Category	Skill	Major	L	P	Pr	C
							3	0	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	Recall that immunology is the study of the immune system, while serology focuses on blood serum and its components, particularly antibodies and antigens, used to diagnose diseases.	1
CLO2	Explain how the immune system defends the body against infections by recognizing and responding to pathogens through immune cells and antibodies.	2
CLO3	Apply immunology and serology principles by demonstrating how tests like antibody titers and antigen detection are used to diagnose infections or assess immunity.	3
CLO4	Analyze how the immune response, including inflammation and the production of antibodies, helps protect the body but can also lead to autoimmune diseases if dysfunctional.	4
CLO5	Evaluate how improper immune responses, such as allergies or immune deficiencies, can compromise health and lead to chronic conditions or infections.	5

Module 1: Introduction to Immunology
Overview of the immune system, Components of the immune system (cells, tissues, organs), Types of immunity (innate and adaptive), Immune response mechanisms, Antigens and antibodies, Immunological memory.

Module 2: Immune System and Its Functions
Structure and function of lymphoid organs, Hematopoiesis and immune cells, T cells and B cells, Role of cytokines in immune response, Complement system, Phagocytosis and antigen processing.

Module 3: Immunological Techniques
Immunoassays (ELISA, Western blot), Flow cytometry, Immunohistochemistry, Immunoprecipitation, Radioimmunoassay (RIA), Agglutination tests, Immunofluorescence techniques.

Module 4: Antigens and Antibodies
Antigen types and properties, Antibody structure and functions, Types of antibodies (IgG, IgM, IgA, IgE, IgD), Antigen-antibody interactions, Antigenic determinants (epitopes), Immunoglobulin classes.

Module 5: Serology and Diagnostic Immunology
Serological tests for infections, Role of serology in disease diagnosis, Blood typing and cross-matching, Autoimmune disorders, Hypersensitivity reactions, Detection of viral, bacterial, and fungal infections through serology.

Module 6: Immunodeficiencies and Immunotherapy
Primary and secondary immunodeficiencies, HIV and AIDS immunology, Vaccination and immune boosters, Immunotherapy (monoclonal antibodies, cytokine therapy), Immunosuppressive therapies, Immune tolerance and transplantation immunology.

Suggested readings

1. Janeway's Immunobiology by Kenneth Murphy and Casey Weaver
2. Basic Immunology: Functions and Disorders of the Immune System by Abbas, Lichtman, and Pillai
3. Immunology: A Short Course by Richard Coicoand Geoffrey Sunshine
4. Medical Immunology by Warren Levinson
5. Serology for the Clinician by Edward J. Motulsky

Course Code	MC 8	Course Name	Systematic Bacteriology	Course Category	MC	Major	L	P	Pr	C
							0	3	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	List and define the general characteristics and classification of bacteria based on morphology, staining, motility, and structural components.	1
CLO2	Describe the structure and differences between Gram-positive and Gram-negative cell walls, and explain the bacterial growth curve and influencing factors.	2
CLO3	Apply bacterial staining techniques (e.g., Gram stain, AFB, Albert's stain) and biochemical tests to differentiate bacterial species in laboratory settings.	3
CLO4	Analyze the genetic mechanisms in bacteria—plasmids, mutation, transformation, transduction, and conjugation—for understanding gene transfer and resistance.	4
CLO5	Evaluate the morphology, pathogenicity, lab diagnosis, and prophylaxis of medically important gram-positive and gram-negative bacteria using special laboratory techniques, including antimicrobial susceptibility testing and bacteriological analysis of water, milk, and air.	5

Module 1: Bacterial Fundamentals

General characters and classification of bacteria, Morphology based on size, shape, arrangement, motility, Flagella, Spores, Capsules, Cell wall, Plasma membrane, Pili, Ribosomes, Cell wall composition and structure in Gram-positive and Gram-negative bacteria, Bacterial reproduction and growth curve, Factors affecting bacterial growth, Bacterial genetics including plasmid, Mutation, Transformation, Transduction, Conjugation

Module 2: Gram-Negative Bacteria

Morphology, Pathogenicity, Laboratory diagnosis, Prophylaxis of specific gram-negative bacteria

Module 3: Gram-Positive and Miscellaneous Bacteria

Morphology, Pathogenicity, Laboratory diagnosis, Prophylaxis of gram-positive and miscellaneous bacteria

Module 4: Laboratory Techniques

Staining techniques including Gram stain, AFB stain, Albert's stain, Special stains for spore, capsule, flagella, Biochemical tests such as catalase, coagulase, oxidase, indole, MR, VP, citrate, urease, TSI agar, Special laboratory techniques including antimicrobial susceptibility testing, Bacteriological examination of water, Milk, Air

References and Suggested Readings

1. C P Baveja, Text book of Microbiology, 4th Edition 2010, Arya Publication.

2. Arti Kapil, Ananthanarayan and Paniker's Textbook of Microbiology, 9th Edition 2013, Orient BlackSwan.
3. Mark Gladwin , Trattler William , C. Scott, Mahan, Clinical Microbiology Made Ridiculously Simple. 6th Edition 2013, Medmaster.
4. D.R.Arora / Brij Bala Arora, Textbook of Microbiology, 5th Edition 2016, CBS Publishers and Distributors.
5. F. H. Kayser, K. A. Bienz, J. Eckert, Medical Microbiology,10th German Edition 2005, Thieme Stuttgart, New York.
6. Michael Ford, Medical Microbiology, 2nd Edition 2014, Oxford university press.
7. Neal Chamberlain, Medical Microbiology: The Big Picture, 1st Edition 2008, Mc Grew Hill Medical.

Course Code	MDP 3	Course Name	Environmental Sciences	Course Category	MDP	MDP	L	P	Pr	C
							3	0	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	Identify and describe the components of the environment (hydrosphere, lithosphere, atmosphere, biosphere) and explain the interrelationship between human activities and the environment.	1
CLO2	Explain ecosystem structure, components, energy flow, trophic levels, and analyze the characteristics of various ecosystems including terrestrial, freshwater, and marine.	2
CLO3	Apply knowledge of environmental issues (such as greenhouse effect, ozone depletion, and deforestation) to analyze their impacts on global and local ecosystems.	3
CLO4	Analyze various types of pollution (air, water, land) and assess their causes, consequences, and potential control strategies for minimizing environmental degradation.	4
CLO5	Evaluate the effectiveness of environmental protection laws, management practices, and global initiatives (such as IUCN, EPA) in addressing environmental challenges and promoting sustainable practices.	5

Module 1: Components of Environment
Understanding the hydrosphere, lithosphere, atmosphere, and biosphere, defining each with examples, and exploring the interaction between man and the environment.
Module 2: Ecosystem
Introduction to basic concepts of ecosystems, components of ecosystems, tropic levels, food chains, and food webs, ecological pyramids, ecosystem functions, and energy flow in ecological systems, along with characteristics of terrestrial, freshwater, and marine ecosystems.
Module 3: Global Environmental Problems
Examining global environmental issues such as the greenhouse effect, acid rain, El Niño, ozone depletion, deforestation, desertification, salinization, biodiversity loss, and chemical and radiation hazards.
Module 4: Environmental Pollution and Degradation
Analyzing the pollution of air, water, and land, focusing on causes, nature, impacts, and control strategies, with perspectives on pollution in urban, industrial, and rural areas, and the effects of habitat pollution from chlorinated hydrocarbons (DDT, PCBs, dioxins, etc.), endocrine-disrupting chemicals, and nutrient pollution.
Module 5: Environmental Management
Understanding health and sanitation in environmental contexts, identifying environmental diseases (infectious and pollution-related), exploring the spread and control of these diseases, and addressing

health hazards due to pesticide and metal pollution, waste treatment, solid waste management, and environmental standards and quality monitoring.

Module 6: Environmental Protection Act

Overview of environmental laws, national movements, and environmental ethics, taking a holistic approach to environmental protection and conservation, with a focus on IUCN's role in environmental protection. Understanding the concept of UN declarations, human rights policies in India, and the recent North-South debate on implementation priorities, as well as the role of the Environmental Protection Agency (EPA).

Module 7: Special Environmental Issues

Focus on oil spills, wastewater treatment, chemical degradation, and the impact of heavy metals on the environment.

References and Suggested Readings

1. Environmental Science: Earth as a Living Planet by G. Tyler Miller and Scott Spoolman
2. Fundamentals of Environmental Science by William P. Cunningham and Mary Ann Cunningham
3. Environmental Science: A Global Perspective by Richard T. Wright and David W. Lea:

Course Code	AEC	Course Name	Communication Skills (English)	Course Category	General	AEC	L	P	Pr	C
							0	4	0	4
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	Use basic English to communicate effectively in everyday situations	3
CLO2	Exchange information and give instructions clearly and effectively	3
CLO3	Describe past experiences, current activities, and future plans	2

Module 1: Everyday English Basics

Getting Started: Alphabet, Colors, Nice to Meet You, About You: Getting to know you, Where are you from?, This is my Family, School: In the classroom, At school, Time: My Day, My Week, My Month, Shopping: How much is it?, Shopping for clothes, Food: At the supermarket, At a restaurant, Food I like, Health: Making an appointment, At the doctor, Community: Finding an apartment, Around town, Work: Jobs, Getting a job, Getting to work, Calling in sick.

Module 2: Everyday English – 1

Greetings and Introductions: Ask - about personal details, what something is called (how to say things in English), where someone is from, Give someone personal details, Greet someone, Introduce - others, someone else, yourself, Talk about your nationality, Tell someone where you are from, Thank someone, Exchanging Information: Arrange a meeting, Ask what kind of work someone does, Give instructions, Talk about - computer parts, schedules, Tell someone what work you do, Family and Friends: Ask about marital status, Compliment someone, Describe someone, Greet someone, Introduce someone, Talk about - art, family, How much? How many?: Ask the price of something, Buy - food, tickets for a concert, Make a salad, Talk about - a band, breakfast, food, pets, quantities, Describing your home: Arrange a meeting, Buy things for - the bathroom, the bedroom, Describe an apartment, Make - plans, suggestions, Plan a party, Talk about - living room furniture, pets, things you use in the kitchen, Tell someone where you live, Thank someone, Describing Routines: Ask - a favor, about someone's daily routine, the time, what kind of work someone does, Disagree with someone, Give instructions, Plan a weekend, Tell someone the time, Talk about - family responsibilities, schedules, Things we can/can't do: Ask - about a birthday, the date, the price of something, Express feelings, Give information about - a party, Invite someone to a party, Make plans, Offer - help, someone food and drink, Plan a party, Refuse politely, Shop for clothing, Solve a problem, What's happening?: Ask someone what's happening, Explain what you are doing, Introduce yourself, Make suggestions, Offer help, Talk about - art, basketball, current actions, dance, what you are doing, Tell someone what's happening.

Module 3: Everyday English – 2

Greetings and Introductions: Ask - about a tourist attraction, about hotel facilities, where someone

is from, Describe - a hotel room, how you feel, Excuse yourself, Greet someone, Introduce yourself, Spell a name, Talk about - likes and dislikes, professions, Routines and Actions: Ask - about a tourist attraction, where someone is, Talk about - art, free time, hunger, likes and dislikes, sports, Give - directions, someone your location, Describe - actions that are happening, how you feel, routines, Talking about the Past: Ask about past experiences and events, Describe - a burglary, how you feel, Report a burglary, Talk about the past, Thank someone, Past Experiences: Ask about past experiences and events, Explain Tai Chi, Talk about - animals, basketball, cooking, disappointments, free time, likes and dislikes, professions, sports, Keep in touch, Talking about the Future: Ask about the weather, Get information about the weather, Talk about - a future trip, future plans, space travel, the future, the weather, Give information about the weather, Let's Trade Apartments: Ask a favor, Buy presents, Plan a weekend, Talk about - a future trip, things we must / mustn't do, things we should / shouldn't do, Things we have done: Talk about - past experiences and events, sports, things you have / haven't done, your dreams, your interests, Solve problems on a trip, Comparing People and Things: Apologize, Go shopping for clothes, Keep in touch, Pack a suitcase, Say goodbye to a friend, Talk about a tour.

Suggested Readings

1. "English Communication for Technical Students" by M. Ashraf Rizvi
2. "English for Everyone: English Vocabulary Builder" by DK
3. "The Elements of Style" by William Strunk Jr. & E.B. White
4. "Improve Your English: English in the Workplace" by D. H. Palmer
5. How to Speak and Write Correctly" by Joseph

Semester IV

Course Code	MC	Course Name	Histopathology and Cytology	Course Category	MC	Major	L	P	Pr	C
							0	3	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	Recall that histopathology involves the study of tissue samples to diagnose diseases, while cytology focuses on the examination of individual cells for diagnostic purposes.	1
CLO2	Explain how histopathology identifies disease at the tissue level, such as cancer or infections, by examining cell structures and patterns under a microscope.	2
CLO3	Apply histopathology and cytology principles by demonstrating how biopsy samples and Pap smears are analyzed to detect abnormalities like tumors or infections.	3
CLO4	Analyze how understanding cellular changes in histopathology and cytology aids in diagnosing diseases, determining treatment plans, and predicting outcomes.	4
CLO5	Evaluate how missed diagnoses in histopathology or cytology can lead to delays in treatment, disease progression, and poor patient outcomes.	5

Module 1: **Introduction to Histopathology and Cytology**

Basics of Histopathology and Cytology: Definition and scope of histopathology and cytology. Introduction to normal tissue architecture and cellular structures,Pathological Changes in Tissues and Cells: Identification of pathological alterations in tissues and cells. Microscopic examination techniques for recognizing abnormalities.

Module 2: **Fixation Techniques and Tissue Processing**

Importance of Fixation in Histopathology: Principles of tissue fixation and its significance. Common fixation methods and their applications ,Tissue Processing Procedures: Overview of tissue processing steps including dehydration, clearing, embedding, block preparation. Techniques for efficient tissue sample processing

Module 3: **Microtome Operation and Sample Dissection**

Introduction to Microtome: Principles of microtomy and its role in histopathology. Types of microtomes and their functions along with advantages and disadvantages, Proper Microtome Operation: Techniques for precise sample sectioning. Troubleshooting common issues during microtomy.

Module 4: **Staining Techniques in Histopathology and Cytology**
Basics of Staining in Histopathology: Overview of staining principles and objectives. Commonly used stains (H and E Staining) in histopathology and cytology ,Specialized Staining Techniques: Techniques for highlighting specific cellular components. Interpretation of stained samples under the microscope.

Module 5: **Cellular Pathogenesis in Histopathology and Cytology**
Cellular Changes in Disease: Understanding cellular responses to various diseases. Recognition of specific pathogenic features in cells ,Case Studies and Applications: Analysis of case studies illustrating cellular pathogenesis. Integrating knowledge to identify specific pathogenesis in cells.

Suggested readings

1. Theory and Practice of Histological Techniques by John D. Bancroft and Marilyn Gamble
2. Basic Histopathology: A Colour Atlas and Text by V. K. S. Saxena
3. Cytology: Diagnostic Principles and Clinical Correlates by Elad D. Benjamin and David A. Rimm
4. Color Atlas of Cytology, Histology, and Microscopic Anatomy by William G. Klauber
5. Histology: A Text and Atlas by Michael H. Ross and Wojciech Pawlina

Course Code	MC 10	Course Name	Clinical Virology and Mycology	Course Category	MC	Major	L	P	Pr	C
							0	3	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	List the general properties and classifications of medically important viruses and fungi, along with examples of significant viral and fungal infections.	1
CLO2	Describe the modes of viral and fungal transmission, clinical significance of selected pathogens (e.g., HIV, Hepatitis, Dermatophytes), and the principles behind sample collection, transport, and storage.	2
CLO3	Demonstrate appropriate laboratory techniques for the cultivation, identification, and diagnosis of viral and fungal infections using conventional and molecular methods..	3
CLO4	Compare and contrast superficial, subcutaneous, and systemic fungal infections in terms of clinical presentation, causative agents, and diagnostic features.	4
CLO5	Interpret laboratory findings and evaluate their clinical relevance in diagnosing and managing viral and fungal diseases in healthcare settings.	5

Module 1: Virology
General properties of viruses, Collection of clinical samples, Transportation and storage of clinical samples, Cultivation of viruses, Molecular methods for virus diagnosis

Module 2: Clinically Important Viruses
Human immunodeficiency viruses, Viral hepatitis, Rabies virus, Herpes viruses, Influenza viruses, Rubella, Mumps, Measles, Rota virus, Poliomyelitis, Japanese encephalitis, Dengue, Chikungunya, Human oncogenic viruses, Kyasanur forest disease

Module 3: Mycology
General properties of fungi, Morphology of pathogenic fungi, Taxonomy of pathogenic fungi, Superficial fungal infections, Cutaneous fungal infections, Subcutaneous fungal infections, Systemic fungal infections, Laboratory diagnosis of fungal infections

Module 4: Common Fungal Infections
Dermatophytes, Candidiasis, Mycetoma, Rhinosporidium, Sporotrichosis, Histoplasmosis, Blastomycosis, Coccidioidomycosis, Paracoccidioidomycosis, Cryptococcosis, Aspergillosis, Penicilliosis, Zygomycosis, Pneumocystis

References and Suggested Readings

1. C P Baveja, Text book of Microbiology, 4th Edition 2010, Arya Publication.
2. Arti Kapil, Ananthanarayan and Paniker's Textbook of Microbiology, 9th Edition 2013, Orient BlackSwan.
3. Mark Gladwin , Trattler William , C. Scott, Mahan Clinical Microbiology Made Ridiculously Simple. 6th Edition 2013, Medmaster
4. D.R.Arora / Brij Bala Arora, Textbook of Microbiology, 5th Edition 2016, CBS Publishers and Distributors.
5. F. H. Kayser, K. A. Bienz, J. Eckert, Medical Microbiology,10th German Edition 2005, Thieme Stuttgart, New York.
6. Michael Ford, Medical Microbiology, 2nd Edition 2014, Oxford university press.
7. Neal Chamberlain, Medical Microbiology: The Big Picture, 1St Edition 2008, Mc Grew Hill Medical.

Course Code	VAC-1	Course Name	Cultural Diversity in the Indian Society	Course Category	VAC	VAC	L	P	Pr	C
							3	0	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	Define and describe the key components of Indian culture and explain the factors contributing to its diversity.	2
CLO2	Analyse the role of major religions in shaping India's societal fabric and historical coexistence.	2
CLO3	Examine the linguistic landscape of India and its impact on national identity and social cohesion.	3
CLO5	Evaluate the diversity of ethnic and tribal communities, their challenges, and contributions to India's cultural mosaic.	3
CLO6	Assess the impact of globalization and modernization on Indian culture and propose strategies to promote cultural harmony and integration.	2

Module 1: Foundation of Indian Diversity
Define culture and its components (language, religion, customs, traditions, art, etc.), Explain the historical factors contributing to India's cultural diversity (geographic, linguistic, religious, and social), Analyse the concept of unity in diversity and its relevance to Indian society.

Module 2: Religious Diversity
Describe the major religions of India (Hinduism, Islam, Christianity, Sikhism, Buddhism, Jainism) and their core beliefs, Examine the historical coexistence and conflicts among different religious groups, Analyse the role of religion in shaping Indian society and culture.

Module 3 - Linguistic Diversity
Explain the linguistic landscape of India, including Indo-Aryan, Dravidian, and other language families., Analyse the impact of language diversity on identity, communication, and social cohesion, Discuss the role of language in nation-building and cultural integration.

Module 4 – Ethnic and Tribal Diversity
Define ethnicity and tribe, and differentiate between them, Explore the diversity of ethnic and tribal groups in India, their geographical distribution, and cultural practices, Analyse the challenges faced by ethnic and tribal communities in contemporary India.

Module 5 – Cultural Dynamics and Challenges
Examine the processes of acculturation, assimilation, and pluralism in Indian society, Analyse the impact of globalization and modernization on Indian culture, Discuss the challenges posed by cultural diversity, such as communalism, casteism, and regionalism, Explore strategies for promoting

cultural harmony and national integration.

Suggested Readings

1. "India After Gandhi: The History of the World's Largest Democracy" by Ramachandra Guha
2. "The Wonder That Was India" by A.L. Basham
3. "India: A Sacred Geography" by Diana Eck
4. An Area of Darkness" by V.S. Naipaul
5. "India Unbound" by Gurcharan Das

Course Code	SEC 3	Course Name	Professional Skills (Career Skills)	Course Category	SEC	SEC	L	P	Pr	C
							3	0	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

COURSE LEARNING OUTCOME

CLO1	Prepare a professional fit to purpose résumé in line with the job description and digital and AI-era practices
CLO2	Prepare for job interviews
CLO3	Participate in recruitment-related group discussions
CLO4	Prepare self for achieving career goals through career planning and life-long learning
CLO5	Identify career opportunities in consideration of personal potential and aspirations.

Module 1: Résumé Skills

- **Résumé Skills: Preparation and Presentation** - Comprehend the importance of a résumé, identify essential components of a good résumé while preparing it.
- **Résumé Skills: Common Errors** - Identify common errors in a résumé.
- **Keywords Specific Resume** - Align resume to new-age AI-powered hiring practices
- **Skills vs Job Description** - Prepare a resume to map the job description
- **Make Specialized Resumes for Different Job Applications** - Create Resumes using AI Tools
- **Self-Presentation Even Before Interview** - Present a Video Resume
- **Work Portfolio** - Prepare a work portfolio
- **Digital Media Profiles** - Manage professional presence on digital media platforms

Module 2: Interview Skills

- **Introduction to Interviews** - Describe the meaning and types of interviews.
- **Common questions** - Describe the important questions generally asked in a job interview.
- **Exchange of views**
- **Interview Skills: Preparation and Presentation** - List key interviewee skills
- **Interview Procedure** - Describe the interview procedure
- **Interview Skills: Common Errors** - Identify common errors people make during an interview.

Module 3: Interview Simulation

- **Job Simulation Formats** - Critique the performance of a few simulated interviews
- **Comment Critically on Simulated Interviews** - Critique the performance of a few simulated interviews
- **Demonstrate an Ideal Interview** - Critique the performance of a few simulated interviews

Module 4: Group Discussion Skills

- **Meaning and Importance of Group Discussion** - Describe the meaning and importance of a Group Discussion in a selection process.
- **Procedure of a Group Discussion** - Describe the procedure of a Group Discussion, identify essential skills to be evaluated during a Group Discussion.

- **Group Discussion: Common Errors** - Identify common errors people commit in a Group Discussion.
- **Group Discussion: Simulation** - Identify common errors people commit in a Group Discussion.

Module 5: Career Planning

- **What is Career? Why a Specific Career?** - Explain the process of career development and its importance for professionals
- **Importance of Career Development** - Explain the process of career development and its importance for professionals
- **Knowing Yourself — Personal Characteristics (MBTI - personality Test)** - Explain the process of career development and its importance for professionals
- **Career Aptitude Tests** - Explain the process of career development and its importance for professionals
- **Career opportunities in Industry & Goals** - Explain the process of career development and its importance for professionals

Module 6: Exploring Career Opportunities

- **Knowledge about the World of Work** - Identify career opportunities in selected fields of work
- **Sources of Career Information** - Identify career opportunities in selected fields of work
- **Skills & Career - Current Trends** - Identify career opportunities in selected fields of work
- **Process of Career Exploration** - Identify career opportunities in selected fields of work

Module 7: Lifelong Learning

- **Developing Eligibility** - Develop skills and abilities to support career goals using life-long learning
- **Concept of Life-Long Learning** - Develop skills and abilities to support career goals using life-long learning
- **Sources of Life-long learning** - Develop skills and abilities to support career goals using life-long learning
- **Case Study** - Use the necessary components to prepare for a career in an identified occupation (as a case study).

Suggested Readings

1. Knock 'em Dead Resumes – *Martin Yate*
2. The Resume Writing Guide – *Lisa McGrimmon*
3. Modernize Your Resume – *Wendy Enelow & Louise Kursmark*
4. Cracking the Code to a Successful Interview – *Evan Pellett*
5. 101 Great Answers to the Toughest Interview Questions – *Ron Fry*
6. Interview Like a Boss – *Hans Van Nas*
7. How to Answer Interview Questions – *Peggy McKee*

Semester V

Course Code	**MC 11**	**Course Name**	Routine and Special Diagnostic Tests	**Course Category**	MC	Major	L	P	Pr	C
							0	3	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	Recall the principles and procedures for common laboratory tests in hematology, clinical chemistry, microbiology, immunology, and blood banking.	1
CLO2	Explain the clinical significance of diagnostic tests such as CBC, LFT, RFT, ELISA, blood grouping, and PCR in disease identification and monitoring.	2
CLO3	Demonstrate the correct use of laboratory instruments, sample processing techniques, and safety practices across various lab departments.	3
CLO4	Interpret laboratory test results and differentiate between normal and pathological findings through case-based problem-solving.	4
CLO5	Assess complex test outcomes, troubleshoot instrument or test issues, and contribute to clinical decision-making during practical rotations.	5

Module 1: Routine Diagnostic Tests

Hematology: Complete Blood Count (CBC), blood smear examination, coagulation tests including Prothrombin Time (PT) and Activated Partial Thromboplastin Time (aPTT). **Clinical Chemistry**: Basic biochemical tests for electrolytes, glucose, urea, and creatinine, liver function tests including ALT, AST, and bilirubin, renal function tests including Blood Urea Nitrogen (BUN) and urinalysis. **Microbiology**: Basic bacteriology including gram staining and culture methods, mycology for detecting fungal infections, parasitology through stool sample microscopy. **Immunology and Serology**: Basic immunoassays such as ELISA, autoimmune panels including Antinuclear Antibody (ANA) and Rheumatoid Factor (RF). **Blood Banking**: Blood typing for ABO and Rh, crossmatching procedures, blood component therapy involving red cells and plasma.

Module 2: Special Diagnostic Tests

Advanced Hematology: Hemoglobin electrophoresis, flow cytometry for cell analysis, molecular hematology for detecting genetic mutations. **Advanced Clinical Chemistry**: Endocrine testing for thyroid and hormonal markers, cardiac markers including Troponin and BNP. **Advanced Microbiology**: Molecular diagnostics using PCR, mycobacterial and viral cultures for detecting complex infections. **Specialized Immunology and Serology**: Immunoassays for HIV and Hepatitis, allergen testing using serum IgE and skin tests. **Specialized Blood Banking**: Advanced blood typing techniques, identification and troubleshooting of blood transfusion reactions.

Module 3: Laboratory Techniques and Instrumentation
Basic Laboratory Techniques: Pipetting and measurement precision, centrifugation for separation of components, microscopy for cellular analysis. **Instrumentation**: Principles and operation of analyzers such as spectrophotometers and hematology analyzers, maintenance and troubleshooting of laboratory equipment.

Module 4: Practical Experience and Case Studies
Hands-On Laboratory Sessions: Routine diagnostic test procedures, performance and analysis of special diagnostic tests. **Case Studies and Problem Solving**: Clinical case analysis and interpretation of test results, understanding and interpreting complex laboratory findings. **Clinical Rotations**: Departmental lab rotations, interaction with clinical teams to correlate lab data with patient care.

References and Suggested Readings

1. Clinical Hematology: Theory and Procedures by Mary Louise Turgeon
2. Tietz Fundamentals of Clinical Chemistry and Molecular Diagnostics by Carl A. Burtis and David E. Bruns
3. Basic and Clinical Immunology by Daniel P. Stites and L. Michael H. Terr
4. Color Atlas of Clinical Microbiology by L. H. Wang and D. W. H. McCormack
5. Blood Banking and Transfusion Medicine: Basic Principles and Practice by Christopher D. Hillyer
6. Clinical Chemistry: Principles, Techniques, and Correlations by Michael L. Bishop, Edward P. Fody, and Larry E. Schoeff
7. Manual of Clinical Microbiology by Karen C. Carroll, Michael A. Pfaller, and David W. Warnock
8. Molecular Diagnostics: Techniques and Applications for the Clinical Laboratory by John M. S. Bartlett and David A. Scott

Course Code	MC 12	Course Name	Pathophysiology and disease diagnosis	Course Category	MC	Major	L	P	Pr	C
							0	3	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	Define key pathophysiological terms and describe the etiology, risk factors, signs, and symptoms of common systemic diseases.	1
CLO2	Explain the underlying mechanisms of both communicable and non-communicable diseases affecting major body systems.	2
CLO3	Apply knowledge of disease processes to interpret clinical signs and laboratory findings for common conditions such as diabetes, hypertension, and cancer.	3
CLO4	Analyze hormonal and enzymatic lab test results (e.g., TSH, Insulin, PSA) to differentiate between physiological and pathological conditions.	4
CLO5	Evaluate advanced diagnostic tools and cancer markers for their clinical relevance, and propose appropriate therapeutic or research-based interventions.	5

Module 1: Pathophysiology Fundamentals
Definition and terminology of pathophysiology, pathology of diseases including etiology, risk factors, signs and symptoms, systemic pathology of various body systems including blood vessels, lymphatics, liver, exocrine pancreas, kidney, endocrine system, musculoskeletal system, and nervous system, system-associated diseases including communicable and non-communicable diseases, overview of disease diagnosis and treatment.

Module 2: Diseases and Therapeutics
Etiology and disease management of various conditions including fever (acute and chronic), allergy, stress, burns, obesity, hypertension, diabetes, cardiovascular diseases, gout, osteopenia, osteoporosis, peptic ulcer, diarrhea, constipation, malabsorption syndromes such as carbohydrate, fat, lactose intolerance and celiac disease, inborn errors of metabolism, renal disorders, and infectious diseases.

Module 3: Cancer
Types of cancer including benign and malignant, cancer markers such as CA15-3, CA19-9, CA-125, PSA, CEA, alpha-fetoprotein, and beta-HCG, cancer pathophysiology, therapeutics, and current research trends.

Module 4: Advanced Laboratory Diagnosis
Assessment of enzymes and hormones including T3, T4, TSH, testosterone, estrogens, progesterone, prolactin, FSH, ADH, insulin, and glucagon, laboratory testing and clinical interpretation of communicable and non-communicable diseases, latest advancements in laboratory diagnosis and research.

References and Suggested Readings

1. Handbook of Pathophysiology by Joan P Frizzell
2. Text Book of Pathophysiology by Dr.RajpalBansal, Dr.Anu Gupta
3. Diabetes Mellitus: Williames and Wikins Co., USA
4. U Satyanarayan and U Chakrapani, Text book of Biochemistry, 4th Edition 2013, Elsevier.
5. M N Chatterjea and RanaShinde, Text book of Medical Biochemistry , 8th Edition 2012, Jaypee Brothers Medical Publishers (P) Ltd.

Course Code	MI 1	Course Name	Hospital Administration	Course Category	MI	Minor	L	P	Pr	C
							3	0	0	3
Pre-requisite			Nil	Co-requisite		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	Define hospital management, describe healthcare systems, hospital types, departmental structures, and the roles of hospital administrators.	1
CLO2	Explain healthcare policies, accreditation, licensing requirements, and ethical considerations in healthcare management.	2
CLO3	Discuss financial management concepts in healthcare organizations including budgeting, revenue cycle management, and cost containment strategies.	3
CLO4	Describe human resource management in healthcare covering recruitment, training, retention, employee relations, and legal/ethical issues.	4
CLO5	Analyze quality improvement methodologies, patient safety initiatives, adverse event reporting, and NABH standards in hospitals.	5

Module 1: Introduction to Hospital Management
Introduction of healthcare system and hospital management: Definition, departments, types of hospital, hierarchy, roles and responsibilities of hospital administrators. Importance: hospital administration in healthcare delivery.

Module 2: Healthcare Policies and Regulations
Introduction, compliance requirements (e.g., accreditation, licensing). Ethical considerations in healthcare management.

Module 3: Financial Management in Healthcare
financial management in healthcare organizations, Budgeting, revenue cycle management, and financial reporting. Cost containment strategies in healthcare

Module 4: Human Resource Management in Healthcare
HR Policy: Recruitment, training, and retention of healthcare personnel.

Employee relations and performance management: Legal and ethical issues in human resource management in healthcare.

Module 5: Quality Improvement and Patient Safety
Concepts: methodologies of quality improvement in healthcare, Patient safety: Initiatives and adverse event reporting systems. Implementing quality improvement projects in hospitals, Introduction to NABH, definition, 5 Patient chapter, 5 hospital Staff chapters as per NABH.

Module 6: Information Technology in Healthcare

Introduction: Role of information technology in healthcare administration, Electronic health records (EHRs): implementation and interoperability, Data security and privacy in healthcare IT systems.

Suggested Readings

1. Hospital Management and Administration by V. K. Raina
2. Healthcare Management by Stephen Walston
3. Financial Management of Health Care Organizations: An Introduction to Fundamental Tools, Concepts, and Applications by William N. Zelman, Michael J. McCue, and Alan R. Millikan
4. Human Resource Management in Health Care: Principles and Practice by L. Fleming Fallon Jr.
5. Patient Safety and Healthcare Improvement at a Glance by Sukhmeet Panesar, Andrew Carson-Stevens, Sarah Salvilla, Aziz Sheikh

Course Code	MI 2	Course Name	Research Methodology and Biostatistics	Course Category	MI	MI	L	P	Pr	C
							3	0	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	Define research methods, differentiate between experimental, exploratory, and other research types, and identify research problems.	1
CLO2	Explain ethical issues in research including clinical trials, the role of ethical committees, and social ethics.	2
CLO3	Describe basic biostatistics concepts, types of data, research tools, and data collection methods.	3
CLO4	Develop a comprehensive research proposal incorporating patient information and diagnostic data models.	4
CLO5	Utilize advanced research tools and software for reference management, document formatting, and plagiarism detection.	5

Module 1: Basic of Research
Introduction to research methods, Identifying research problem, How this research differ from other experimental research, and exploratory research.

Module 2: Ethics
Ethical issues in research, Research design, Ethics of clinical trials, permission of ethical committee, social ethics.

Module 3: Biostatistics
Basic Concepts of Biostatistics, Types of Data, Research tools and Data collection methods, Need of biostatistics, Understanding of data in biostatistics, How and where to get relevant data, Relation between data and variables, Type of variables: defining data set

Module 4: Research Proposal
Developing a research proposal-Models by engaging patients information and data-base of the diagnostic approaches

Module 5: Uses of Advanced Research Tools
Management Software like Zotero/Mendeley, Software for paper formatting like LaTeX/MS Office, Software for detection of Plagiarism.

Suggested Readings

1. Kothari, C.R. (2004). Research Methodology. New Age International Pvt Ltd Publishers. ISBN: 9788122436235
2. Peacock, Janet L., and Peacock, Philip J. (2011). Oxford Handbook of Medical Statistics. Oxford University Press. ISBN-13: 978-0199551286
3. Bhome, S., Prajapati, N., Deshmukh-Ghate, D., and Ghosh, A. (2015). Research Methodology. Himalaya Publishing House. ISBN: 978-93-5202-807-8
4. Goyal, R.C. (2013). Research Methodology for Health Professionals. Jaypee Brothers Medical Publishers. ISBN-13: 978-9350251010
5. Creswell, J.W. (2014). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches. SAGE Publications. ISBN: 978-1452226101
6. Polit, D.F., and Beck, C.T. (2017). Nursing Research: Generating and Assessing Evidence for Nursing Practice. Wolters Kluwer. ISBN: 978-1496384548

Course Code	AEC 2	Course Name	Business Communication	Course Category	AEC		L	P	Pr	C
							0	4	0	4
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	Discuss the scope and complexity of business communications	1
CLO2	Carry out effective interpersonal communication, including the use of listening skills, verbal skills and non-verbal communication	2
CLO3	Apply practical techniques for effective group communication, including presentations, interviews, meetings, conferences, public relations	3
CLO4	Carry out written business correspondence including letters, documents reports, etc.	4
CLO5	Communicate effectively with the help of digital media including emails, virtual meetings and social media posts	5

Module 1: Overview of Business Communications

Introduction to Business communication – Introduction, Scope of Business Communications, Complexity of Business Communications, Importance of Communication for Business, Impact of Poor Communication, Definition and Introduction to Business Communication, Types and Levels of Business Communication, Types of Business Communication, Levels of Business Communication, Real-Life Examples-Based Exercises for Practice, Dimensions of communication in an Organisation – Introduction, Discussing the Scope and Complexity of Business Communications, Common Dimensions of Communication in an Organization, Common Channels of Communication in an Organization, Real-Life Examples-Based Exercises for Practice, Channels of communication in an organization – Introduction, Discussing the Scope and Complexity of Business Communications, Understanding and Applying the Level of Communication in Vertical and Horizontal Hierarchy, Barriers to Business Communication – Introduction, Discussing the Scope and Complexity of Business Communications, Discussing the Barriers Observed in Effective Business Communications, Engaging in Real-Life Examples-Based Exercises to Overcome Communication Barriers.

Module 2: Interpersonal Skills

Effective interpersonal communication – Introduction, Carrying Out Effective Interpersonal Communication, Describing Effective Interpersonal Communication, Applying Knowledge through Real-Life Examples-Based Exercises, Listening Skills – Introduction, Carrying Out Effective Interpersonal Communication, Applying Effective Listening Skills, Enhancing Practical Mastery through Real-Life Examples-Based Exercises, Speaking Skills – Introduction, Carrying Out Effective Interpersonal Communication, Applying Effective Speaking Skills, Reinforcing Practical Mastery through Real-Life Examples-Based Exercises, Loud Reading Skills – Introduction, Understanding

Non-Verbal Cues, Impact of Non-Verbal Communication, Developing Effective Non-Verbal Communication Skills, Real-Life Examples and Exercises, Non-Verbal Communication – Introduction, Reading Beyond the Surface, Reading and Interpersonal Communication, Decoding the Unspoken, Real-Life Examples and Exercises.

Module 3: Group Communications

Principles of group communication – Introduction, Core Principles, Applicability Across Settings, Real-Life Exercises, Effective presentations – Introduction, Building a Winning Presentation, Time Management: Your Key Ally, Real-Life Examples and Exercises, Effective Meetings and conferences – Introduction, Building Effective Gatherings, Real-Life Examples and Exercises, Effective Interviews – Introduction, Preparation: Fueling Your Confidence, Shining in the Spotlight: Commanding the Conversation, Adapting to Diverse Stages: Navigating Different Dynamics, Beyond the Conversation: Leaving a Lasting Impression, Real-Life Exercises for Success.

Module 4: Written Business Correspondence

Letter Writing – Introduction, Core Principles for Clarity and Impact, Exploring Diverse Forms of Correspondence, Ethical Considerations and Cultural Awareness, Real-Life Exercises for Growth, Report Writing – Introduction, Key Principles, Types of Business Reports, Real-Life Exercises, Documentation maintenance – Introduction, The Value of Good Maintenance, Navigating the Physical and Digital, Mastering the Maze: Organization and Categorization, Version Control: Preserving the Chain of History, Safeguarding the Knowledge: Security Measures, Real-Life Exercises.

Module 5: Digital Business Correspondence

Email Etiquette – Introduction, The Pillars of Professionalism, To, CC, and BCC, Subject Line, Opening Salutation, Closing Salutation, Pro Tip, Virtual Meetings and Netiquette – Introduction, Choosing the Right Platform, Preparation is Key, Communication and Netiquette, Building Rapport and Collaboration, Real-Life Exercises, Visual Storytelling, Collaborative Learning, Expanding Your Toolbox, Examples for Real-Life Exercises, Digital Work Collaboration – Notion, etc. – Introduction, Building Bridges, Not Walls, The Digital Toolkit, Mastering the Symphony, Real-Life Exercises, Engaging Activities, Expanding Your Toolkit.

Module 6: Social Media Communications and Digital Marketing

Introduction to social media communications – Discuss the various social media communications used in business and digital tools and best practices associated with them, Introduction to digital marketing – Discuss the various social media communications used in business and digital tools and best practices associated with them.

Suggested Readings

1. Business Communication: Process and Product by Mary Ellen Guffey
2. Business Communication Today by Courtland L. Bovee and John V. Thill
3. The Business Communication Handbook by Judith Dwyer
4. Effective Business Communication by Herta A. Murphy
5. Business Communication: A Case Method Approach by P.D. Chaturvedi

Semester 6

Course Code	MI 3	Course Name	Biomedical Waste Management	Course Category	Skill	Minor	L	P	Pr	C
							3	0	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	Recall the key principles and regulations of biomedical waste management.	1
CLO2	Explain the different types of biomedical waste and their proper classification and disposal methods.	2
CLO3	Apply appropriate procedures for handling, storage, and disposal of biomedical waste in healthcare settings.	3
CLO4	Analyze the environmental and health impacts of improper biomedical waste disposal and the importance of safe practices.	4
CLO5	Evaluate the effectiveness of biomedical waste management programs in minimizing health risks and ensuring regulatory compliance.	5

Module 1: Introduction to Biomedical Waste and Regulations
definition of biomedical waste, the various types of biomedical waste (infectious, non-infectious, hazardous), and the regulations governing its management, global standards and national guidelines for biomedical waste disposal, with a focus on the role of healthcare facilities in waste management.

Module 2: Classification and Segregation of Biomedical Waste
identifying and classifying different categories of biomedical waste, such as sharps, pathological waste, pharmaceutical waste, and chemical waste., importance of proper segregation at the source to ensure safe handling and disposal, including the use of color-coded bins and labels for each waste type.

Module 3: Handling, Storage, and Transportation of Biomedical Waste
safe handling and storage practices for biomedical waste to prevent contamination and exposure, guidelines on storing waste in appropriate containers, the need for secure transportation within healthcare facilities, and the protocols for safely moving waste to disposal sites.

Module 4: Treatment and Disposal Methods
various treatment and disposal methods for biomedical waste, including autoclaving, incineration, chemical disinfection, and landfilling, emerging technologies and techniques for reducing the environmental impact of waste disposal, as well as the criteria for selecting appropriate methods based on the type of waste.

Module 5: Health and Environmental Impact of Improper Waste Management

potential risks of improper biomedical waste management, including exposure to infections, toxins, and environmental pollution., consequences of inadequate waste disposal on public health and the environment, emphasizing the need for education, training, and adherence to waste management protocols to mitigate these risks**.**

Suggested Readings

1. Biomedical Waste Management by M.K. Jha
2. Manual of Biomedical Waste Management by Anil Kumar Bhatia
3. Waste Management in Health Care Facilities by M. A. S. S. Sudhakar
4. Biomedical Waste: A Manual for Healthcare Institutions by Vinay Kumar
5. Biomedical Waste Management and Infection Control by S. G. Joshi

Course Code	MI 4	Course Name	Lab Operation and Safety Process	Course Category	Skill	Minor	L	P	Pr	C
							3	0	0	3
Pre-requisite			Nil	**Co-requisite**		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	Identify different types of laboratories and list the roles and responsibilities of laboratory personnel, safety equipment, and regulatory agencies like OSHA and EPA.	1
CLO2	Explain the principles behind key lab procedures such as sample handling, centrifugation, pipetting, and proper use of PPE and emergency protocols.	2
CLO3	Demonstrate safe handling, labeling, storage, and disposal of chemicals and biohazardous materials following MSDS and biosafety guidelines.	3
CLO4	Differentiate between biosafety levels (BSL-1 to BSL-4) and evaluate laboratory hazards including chemical, electrical, and mechanical risks.	4
CLO5	Assess laboratory compliance with SOPs, safety protocols, and regulatory standards through written exams, practical assessments, and continuous performance evaluation.	5

Module 1: Introduction to Laboratory Operations
Overview of laboratory environments, Types of laboratories (clinical, research, industrial), Functions and settings of each type, Roles and responsibilities in the lab, Duties of lab technicians, technologists, and managers
Module 2: Laboratory Techniques and Equipment
Sample collection and handling, Centrifugation techniques, Pipetting procedures, Operation of microscopes, spectrophotometers, and analyzers, Equipment maintenance, Ensuring precision and accuracy in procedures
Module 3: Laboratory Safety Protocols
Personal protective equipment (PPE), Emergency procedures (chemical spills, fire, exposure), First aid practices, Location and use of safety equipment (exits, fire extinguishers, kits)
Module 4: Chemical Safety
Safe chemical handling and storage, Labeling and containment, Material Safety Data Sheets (MSDS) interpretation, Chemical waste disposal methods, Environmental compliance
Module 5: Biological Safety
Biosafety levels (BSL-1 to BSL-4), Containment procedures, Handling and disposal of biohazardous materials, Infection control protocols, Decontamination techniques
Module 6: Electrical and Mechanical Safety
Safe operation of electrical equipment, Preventive maintenance schedules, Identifying mechanical hazards, Minimizing risks from moving parts and mechanical systems
Module 7: Health and Safety Regulations

Safe chemical handling and storage, Labeling and containment, Material Safety Data Sheets (MSDS) interpretation, Chemical waste disposal methods, Environmental compliance

Module 8: Laboratory Procedures and Protocols

Standard Operating Procedures (SOPs), Protocol development and revision, Documentation practices, Recordkeeping and protocol review, Adherence to procedural consistency

Module 9: Assessment and Evaluation

Written examinations on theory and protocols, Practical exams on lab skills and safety, Continuous evaluation of performance and compliance

Module 10: Current Trends and Advancements

Innovations in laboratory equipment and safety technologies, Updates to safety standards and practices, Emerging regulations in lab operations, Adapting to technological advancements

References and Suggested Readings

1. Medical Laboratory Science Review" by Robert R. Harr
2. "Laboratory Safety: A Guide for Users and Managers" by Philip A. Hagan
3. "Fundamentals of Medical Laboratory Practice" by Patricia A. Thomas and Kimberly A. Plake
4. "Introduction to Clinical Chemistry: A Textbook" by R. James
5. "Clinical Laboratory Management: Principles and Procedures" by Gary A. Thibault
6. "Biosafety in Microbiological and Biomedical Laboratories (BMBL)" by CDC and NIH
7. "Laboratory Safety: Principles and Practices" by J. M. F. Hester
8. "Quality Management in the Clinical Laboratory" by Barbara H. Estrada and Daniel J. P. Kral

Course Code	VAC	Course Name	Universal Human Values	Course Category	General	VAC	L	P	Pr	C
							3	0	0	3
Pre-requisite			Nil	Co-requisite		Nil				

Course learning outcomes:

CLO No.	At the end of the course the learners will be able to:	Bloom's Taxonomy (Bt) Level
CLO1	Explain the importance of living a harmonious life aligned with universal human values	2
CLO2	Discuss the vast potential of human beings and their responsibility to the universe on its account	2
CLO3	Develop universal human values and practice them consciously to be good human beings	3
CLO4	Conduct oneself in alignment with the universal human values while dealing with the ways of the world	3
CLO5	Explain the importance of living a harmonious life aligned with universal human values	2

Module 1: Introduction to Universal Human Values

Concept of Universal Human Values – Overview, What are values?, Human values, What are universal human values?, Relation with holistic living – What is holistic living?, Relation of universal human values and holistic living.

Module 2: Living in Harmony

Living in harmony - as a human – What is Living in Harmony?, Life in harmony, What does living in harmony look like for an individual?, Living in harmony - as a family – Key roles of shared values, Shared values of families, Living in harmony - as a society and a race – Respect, Equality, Kindness, Honesty, Safety, Diversity, Cooperation, Environmental Care, Freedom.

Module 3: Human Potential

Human potential – individual – How do we unlock human potential?, How to identify our potential?, Human potential – collective – Overview, Collaboration and working together, Impact of individual self on environment – Ripple Effect of Your Interactions, Impact of social group on their environment – Impact of family on environment, Impact of peer group on environment, Who is responsible? – Harmful impact of humans, Positive impact of humans.

Module 4: Developing Universal Human Values

Introduction to Developing Universal Human Values – Developing Human Values, Self Reflection, Educate Yourself, Promote Open-Mindedness, Volunteer and Service, Emulate Role Models in

Actions, Engage in Dialogue, Develop Global Perspective, Love and Compassion – Love and its forms, Love, Compassion and Inter-relatedness, The greatest proponents of Love and Compassion, Practicing Love and Compassion, Truth – Introduction to Truth, Great Individuals who are remembered for their value of truth, Practising Truth, Non-Violence – Introduction to non-violence, Important people who followed and propagated non-violence, Practising non-violence, Service – Introduction to service, Various forms of Service, Constitutional Values, Justice and Human Rights – Fundamental Values, Fundamental Rights, Fundamental Duties, Patriotism, Pride and Gratitude for the Nation, Good Practices – Self Worth, Self-Care, Holistic Living, Mindfulness and Meditation, Self-Reflection, Journal Writing, Impact Assessment.

Module 5: Common Scenarios

Routine Scenarios – Love and Compassion based scenarios, Truth based scenarios, Non-violence based scenarios, Peace based scenarios, Service based scenarios, Renunciation or Sacrifice based scenarios, Life-changing Scenarios – Career Dilemma, Relationship Conflict, Health Crisis, Moral and Ethical Dilemma, Personal Loss, Financial Crisis.

Suggested Readings

1. Human Values and Education by R. R. Gaur
2. The Universal Declaration of Human Rights by UNESCO
3. The Essence of Human Values by G. C. Pati
4. Human Values: A Sociological Perspective by M. H. Geyer
5. Human Values and Ethics in the Workplace by Rajendra P. Joshi