

**GURU KASHI UNIVERSITY**



**Master of Science in Medical Laboratory Technology  
(Hematology and Blood Banking)**

**Session: 2023-24**

**Department of Paramedical Sciences**

### **Graduate Attributes of Program**

The Program M. Sc Medical Laboratory Technology (Hematology and Blood Banking) imparts to the students an intensive knowledge in the field of hematology and blood banking and create qualified and competent personnel to support the health care system.

**Programme Learning Outcomes:** After completion of this program, the learner will be able to

- Under take further advanced research of the highest quality that contributes to knowledge and exhibits authoritative international standing in their own specialization
- Make potentially innovative and important contributions to society, culture and the global community.
- Conduct original and rigorous research, contributing new knowledge and insights to their field of study.
- Formulate effective planning and time management to meet research deadlines and balance academic commitments.
- Explore new ideas and remain updated with the latest developments in their field.
- Think critically and creatively, exploring novel approaches to problem solving and research questions

### Program Structure

<b>Semester –I</b>							
<b>Sr. No.</b>	<b>Course Code</b>	<b>Course Title</b>	<b>Type of course</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	MHB101	Basic Hematology	Core course	4	0	0	4
2	MHB102	Blood Banking	Core course	4	0	0	4
3	MHB103	Hematological Diseases	Core course	4	0	0	4
4	MHB104	Basic Hematology (Practical)	Skill Based	0	0	4	2
5	MHB105	Blood Banking (Practical)	Skill Based	0	0	4	2
<b>Discipline Elective (Any one of the following)</b>							
6	MHB106	Clinical Biochemistry	Disciplinary Elective	3	0	0	3
7	MHB107	Immune-hematology					
<b>Discipline Elective (Any one of the following)</b>							
8	MHB108	Blood Donation & Blood Components	Disciplinary Elective	3	0	0	3
9	MHB109	Medical Lab Management					
<b>TOTAL</b>				<b>18</b>	<b>0</b>	<b>8</b>	<b>22</b>

<b>Semester -II</b>							
<b>Sr. No.</b>	<b>Course Code</b>	<b>Course Title</b>	<b>Type of course</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	MHB201	Advance Hematology	Core Course	4	0	0	4
2	MHB202	Transfusion Medicine	Core Course	4	0	0	4
3	MHB203	Transfusion Reaction and Complications	Core Course	4	0	0	4
4	MHB204	Advance Hematology (Practical)	Skill Based	0	0	4	2
5	MHB205	Transfusion Medicine (Practical)	Skill Based	0	0	4	2
<b>Value Added Course (For other disciplines also)</b>							
6	MHB206	Quality Assurance and Patient Safety	VAC	2	0	0	2
<b>Disciplinary Elective (Any one of the following)</b>							
7	MHB207	Quality Control in Hematology	Disciplinary Elective	3	0	0	3
8	MHB208	Recent Advances in Blood Banking					
<b>Disciplinary Elective (Any one of the following)</b>							
9	MHB209	Clinical Microbiology	Disciplinary Elective	3	0	0	3
10	MHB210	Blood Banking and Human Genetics					
<b>TOTAL</b>				<b>20</b>	<b>0</b>	<b>8</b>	<b>24</b>

**Semester -III**

<b>Sr. No.</b>	<b>Course Code</b>	<b>Course Title</b>	<b>Type of course</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	MHB301	Research Methodology	Compulsory foundation	4	0	0	4
2	MHB398	Research Proposal	Research Skill	0	0	8	4
3	MHB303	Ethics & IPR	Research Skill	2	0	0	2
4	MHB397	Proficiency in Teaching	Research Skill	2	0	0	2
5	MHB396	Service Learning	Research Skill	0	0	4	2
6	MHB306	Computer Lab	Skill Based	0	0	4	2
7	MHB399	XXXX	MOOC	-	-	-	4
<b>Total</b>				<b>8</b>	<b>0</b>	<b>16</b>	<b>20</b>

Semester-IV							
Sr. No.	Course Code	Course Title	Type of Course	L	T	P	Credits
1	MHB401	Dissertation	Skill Based	-	-	-	20
<b>Total</b>				<b>0</b>	<b>0</b>	<b>0</b>	<b>20</b>

### Evaluation Criteria for Theory Courses

A. Continuous Assessment: [25 Marks]

CA1- Surprise Test (Two best out of three) (10 Marks)

CA2- Assignment(s) (10 Marks)

CA3- Term paper/ Quiz/Presentation (05 Marks)

B. Attendance (05 Marks)

C. Mid Semester Test: (30 Marks)

D. End-Semester Exam: (40 Marks)

**Course Title: Basic Haematology**

**Course Code: MHB101**

L	T	P	Cr.
4	0	0	4

**Total Hours 60**

**Learning Outcomes:** On completion of this course, the successful students will be able to

1. Perform routine hematological tests and collection of specimens, reception and labeling and recording of laboratory investigations.
2. Understand about the blood cell formation and its composition, factor affecting production of blood cells, Preparation of smears and staining for diagnostic purposes.
3. Perform hematological testing for diagnosis, internal quality control, external quality control, standardization of instruments.
4. Prepare anticoagulants and their uses in various investigations.

## Course Contents

### UNIT-I

**14 Hours**

Introduction to hematology: Definition, importance, important equipment and chemicals, various tests performed, laboratory organization and safety measures in hematology laboratory. Composition and function of blood: Definition of blood, composition of blood (cells, plasma /serum) Formation of blood: Erythropoiesis, Leucopoiesis, Thrombopoiesis.

### UNIT-II

**16 Hours**

Anticoagulants: Definition, uses, different types, mode of action, their merits and demerits Collection and Preservation of blood Sample for various hematological investigation, Definition, Principle & Procedure, Normal values, Clinical significance, Errors involved, mean to minimize errors for the following.

### UNIT-III

**16 Hours**

Haemoglobinometry: Haemoglobinometry definition, Total Leucocyte count (TLC), Differentiate leucocyte count (DLC), Erythrocyte Sedimentation Rate (ESR), Packed cell volume/ Hematocrit value, Red cell indices (RCL), Absolute Eosinophil count (ESR), Reticulocyte count, Platelet count, Preparation of blood films.

### UNIT-IV

**14 Hours**

Types methods of preparation (Thick and thin smear/film) staining technique in Hematology (Romanovsky stains): Principle, composition, preparation staining reagents and procedure for the Giemsa and Leishman stain.

### Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question-Answer

### Suggested Readings

- *Wintrobe, M. M. (1962). Clinical hematology. Academic Medicine, 37(1), 78.*

- *Bain, B. J., Bates, I., & Laffan, M. A. (2016). Dacie and lewis practical haematology e-book. Elsevier Health Sciences.*
- *Robbins, S. L. (2002). Pocket companion to Robbins pathologic basis of disease. Elsevier Health Sciences TW.*
- *Kumar, V., Abbas, A. K., & Aster, J. C. (2017). Robbins basic pathology e-book. Elsevier Health Sciences.*
- *Godkar, P. B., & Godkar, D. P. (2003). Textbook of medical laboratory technology. Bhalani.*
- *Sood, R. (2009). Concise Book of Medical Laboratory Technology: Methods and Interpretations. Jaypee Brothers Medical Publishers (P) Limited.*
- *Mukherjee, K. L. (2010). Med Lab Tech Vol 1, 2/e. Tata McGraw-Hill Education.*
- *Kolhatkar, A., Ochei, J., & McGraw, T. (2008). Medical Laboratory Science: Theory and Practice.*
- *Kawthalkar, S. M. (2012). Essentials of haematology. JP Medical Ltd.*

**Course Title: Blood Banking**

**Course Code: MHB102**

L	T	P	Cr.
4	0	0	4

**Total Hours: 60**

**Learning Outcomes:** After completion of this course, the learners will be able to

1. Perform the Compatibility test in blood transfusion.
2. Demonstration about the collection of blood for cross matching from a blood bag.
3. Prepare various fractions of blood for transfusion and therapeutic purposes
4. Understand bacterial cell and eukaryotic cell; parallelism between genes and chromosomes.

**Course Contents**

**UNIT-I**

**Hours: 14**



Introduction to Blood Banking History and discovery of various blood group systems ABO blood group system Rh and other major blood group system Sources of error in blood grouping and their elimination.

**UNIT-II****Hours: 14**

ABO grouping: Forward and reverse grouping. Causes of discrimination between forward and reverse grouping Rh grouping, Compatibility test in blood transfusion, Collection of blood for cross matching from a blood bag, Major cross matching, Minor cross matching, Use of enzymes in blood bank specially Papain

**UNIT-III****Hours: 16**

Brief introduction of blood substitute/artificial blood, Hemapheresis: pertaining to Leucocytes, platelets and plasma, Quality control in blood bank, Complications and hazards of blood transfusion, Laboratory investigations of transfusion reactions and mismatched blood transfusion, Precautions while procurement and storage of grouping antisera.

**UNIT-IV****Hours: 16**

Various anticoagulants used to collect blood for transfusion purposes, Selection of donor and procedure for collection of blood from a healthy donor, Preparation of various fractions of blood for transfusion and therapeutic purposes such as: Packed red cells, washed red cells and FROZEN Red cells, Platelet Rich Plasma (PRP), Platelet concentrate and frozen platelets, Fresh plasma (FP), Fresh Frozen Plasma (FFP) and cryoprecipitate

**Transactional modes**

Video based teaching, Collaborative teaching, Case based teaching, Question

**Suggested Readings**

- *Lewis, S. M., Bain, B. J., Bates, I., & Dacie, J. V. (2001). Dacie and Lewis practical haematology. London: Churchill Livingstone*
- *Lawicki, S., Covin, R. and Powers, A., 2017. The Kidd (JK) Blood Group System. Transfusion Medicine Reviews, 31(3), pp.165-172.*
- *Lazarus, H. and Schmaier, A., 2012. Concise guide to hematology. Chichester, West Sussex, UK: Wiley-Blackwell, pp.77-81.*
- *Overfield, J., Dawson, M. and Hamer, D., 2008. Transfusion science. Bloxham, Oxfordshire: Scion*

**Course Title: Haematological Diseases**

**Course Code: MHB103**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr.</b>
<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

**Total Hours: 60**

**Learning Outcomes:** After completion of this course, the learners will be able to

1. Understand the underline pathophysiology of hematological diseases, including the cellular and molecular mechanisms involved.
2. Recognize the signs and symptoms associated with various hematological disorders and differentiate them from other conditions
3. Learn to interpret hematological tests, blood smears, bone marrow aspirates, and imaging studies to arrive at a diagnosis.

4. Understand how to manage patients with hematological disorders, including monitoring, supportive care, and symptom management.

### **Course contents**

#### **Unit-I**

**14 Hours**

Investigation of patients with blood diseases. Anemia. Classification, Degrees of anemic state. Iron Metabolism. Iron deficiency anemia. Definition. Classification. Pathogenesis. Clinical features - major syndromes. Laboratory tests. Diagnostic criteria. Differential Diagnosis. Treatment. Prognosis. Anemia in Chronic Diseases.

Hypo-and aplastic anemias. Pathogenesis. Classification. Aplastic anemia. Definition. Incidence. Pathogenesis. Diagnostic criteria. Differential Diagnosis Treatment. Prognosis. Acquired haemolytic anemias. Immune, autoimmune and drug-induced immune haemolytic anemias.

#### **Unit-II**

**16 Hours**

Malignant Diseases of the Blood and Hematopoietic organs. Major Pathogenetic Mechanisms of Neoplastic Growth. Classification of malignant diseases of the blood and hematopoietic organs. Acute leukemias. Mechanisms of neoplastic growth (oncogenesis). Classification of hematological malignancies. Acute myeloblastic leukemia. Classification. Risk Factors. Clinical manifestation. Diagnostic methods and diagnostic criteria. Differential diagnosis. Principles of treatment, treatment phases, therapeutic response. Prognosis. Acute lymphoblastic leukemia. Principal differences from myeloblastic leukemias. Classification. Clinical manifestation. Diagnostic methods and diagnostic criteria. Differential diagnosis. Prognostic factors. Principles of treatment, treatment phases, therapeutic response. Prognosis

#### **Unit-III**

**14 Hours**

Hemostasis. Bleeding diatheses. Mechanisms of hemostasis. Laboratory diagnostics, clotting assays. Congenital bleeding disorders (coagulopathies). Definition. Classification. Clinical Characteristics of haemorrhagic diathesis. Hemophilia-A and Hemophilia-B. Pathogenesis. Clinical manifestation. Classification. Diagnostic criteria Prenatal diagnosis. Treatment. Prophylactic strategy. Treatment of Haemophilia with Inhibitors. Von Villebrand's disease. Definition Pathogenesis Clinic Classification Diagnostic criteria Treatment

#### **Unit-IV**

**14 Hours**

Thrombocytopathies and thrombocytopenias. Classification. Thrombocytopathies Definition. Classification. Hemostasis laboratory tests. Disseminated intravascular coagulation. Definition.

Etiopathogenesis. Phases. Clinical manifestation. Clinical forms. Diagnostic criteria. Differential diagnosis. Treatment Monitoring.

### Suggested Readings

- *Text book of Medical Laboratory Technology by Paraful B. Godkar*
- *Medical laboratory Technology by KL Mukherjee Volume-I*
- *Practical Haematology by JB Dacie*
- *Clinical Diagnosis & Management by Laboratory methods (20th edition) by John Bernard Henary*
- *Atlas of Haematology (5th edition) by G.A. McDonald*
- *De Gruchy's clinical Haematology in medical practice*

**Course Title: Basic Hematology (Practical)**

**Course Code: MHB104**

L	T	P	Cr.
0	0	4	2

**Total Hours 30**

**Learning Outcomes:** After completion of this course, the learners will be able to

1. Analyze and interpret laboratory results, identify potential sources of error, troubleshoot technical issues, and propose appropriate solutions.
2. Maintain and monitor the quality of laboratory reagents, equipment, and procedures to ensure accurate and reliable results.
3. Determination of red blood cell count, hemoglobin concentration, hematocrit, white blood cell count, and platelet count.

4. Identify and describe normal and abnormal cell types, including differentiating between various types of white blood cells.

### **Course content**

#### **List of Practical's / Experiments:**

**30 Hours**

1. Preparation of various anticoagulants: EDTA, Sodium Citrate, Oxalate with Fluoride
2. Collection of blood sample for various Lab Investigations
3. Demonstration of- Microscopes, Haemocytometers, Colorimeter, Spectrophotometer, Glass pipettes & Auto pipettes, Glassware
4. Haemoglobin (Hb) level: Measures the amount of haemoglobin, the protein responsible for carrying oxygen, in the blood.
5. Identification of Normal blood cells

#### **Urine Analysis:**

1. Physical and Chemical Examination of Urine
2. Routine biochemistry of Urine for: pH, Specific Gravity, Glucose, Ketones, Bilirubin, Albumin
3. Microscopic Examination of Urine

#### **Transactional modes**

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

#### **Suggested Readings**

- *Bain, Imelda, B. and John V. D. (2001). Practical Haematology. London: Churchill Livingstone*
- *Christopher, A. L. (1990) Clinical Haematology.*
- *John, B. H. (2001). Clinical Diagnosis & Management by Laboratory methods.*
- *McDonald, G.A. (1989). Atlas of haematology*
- *Godkar, P. B., & Godkar, D. P. (2003). Textbook of medical laboratory technology. Bhalani.*
- *Stephen, M. (2001). Clinical Haematology (Pathophysiological basis for clinical practice(3rd edition).*

**Course Title: Blood Banking (Practical)**

**Course Code: MHB105**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr.</b>
<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**Total Hours: 30**

**Learning Outcomes:** After completion of this course, the learners will be able to

1. Analyze and interpret laboratory results, identify potential sources of error, troubleshoot technical issues, and propose appropriate solutions.
2. Maintain and monitor the quality of laboratory reagents, equipment, and procedures to ensure accurate and reliable results.
3. Determination of red blood cell count, hemoglobin concentration, hematocrit, white blood

cell count, and platelet count.

4. Identify and describe normal and abnormal cell types, including differentiating between various types of white blood cells.

### **Course Content**

#### **List of Practical's**

1. To prepare Acid Citrate Dextrose (ACD) and Citrate Phosphate Dextrose (CPD) Solutions
2. Screening of blood donor: physical examination including medical history of the donor
3. Collection and preservation of blood for transfusion purpose
4. Screening of blood for Malaria, Microfilaria, HBs Ag, Syphilis and HIV
5. To determine the ABO & Rh grouping
6. Direct or preliminary grouping
7. Indirect or proof grouping
8. Rh grouping and determination of Du in case of Rh negative
9. To perform Direct and Indirect Coomb's test
10. To perform cross matching
11. Major cross matching
12. Minor cross matching
13. Preparation of various fractions of blood.

#### **Transactional modes**

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

#### **Suggested Readings**

- *Bain, Imelda, B. and John V. D. (2001). Practical Haematology. London: Churchill Livingstone*
- *Christopher, A. L. (1990) Clinical Haematology.*
- *John, B. H. (2001). Clinical Diagnosis & Management by Laboratory methods.*
- *McDonald, G.A. (1989). Atlas of haematology*
- *Godkar, P. B., & Godkar, D. P. (2003). Textbook of medical laboratory technology. Bhalani.*
- *Stephen, M. (2001). Clinical Haematology (Pathophysiological basis for clinical practice(3rd edition).*

**Course Title: Clinical Biochemistry**

**Course Code: MHB106**

L	T	P	Cr.
3	0	0	3

**Total Hours 45**

**Learning Outcomes:** After completion of this course, the learners will be able to

- 1 Demonstrate biomolecules, metabolism and inborn errors of metabolism.
- 2 Recall various organ function tests and their significance in result interpretation.
- 3 Correlate the knowledge of patho-physiology of organ system and hormonal imbalance.
- 4 Apply biochemical changes involved in various clinical conditions associated with glands and organs of human body.



## Course Contents

### UNIT-I

**12 Hours**

Chemistry and metabolism of Carbohydrates- Definition, Aerobic & Anaerobic glycolysis, sequence of reactions in glycolysis, regulation in glycolysis, citric acid cycle, glycogenesis, glycogenolysis (sequence of reactions & regulation), Pentose-phosphate pathway (sequence of reactions & regulation), and extraction of energy from food sources.

### UNIT-II

**11 Hours**

Chemistry and metabolism of lipids- Definition, classification, Structures and roles of Fatty acids & Glycerols, beta oxidation of saturated fatty acids, oxidation of unsaturated fatty acids, oxidation of odd chain fatty acids, energy yield, ketone bodies.

### UNIT-III

**10 Hours**

Chemistry and metabolism of proteins- Definition -Important properties of proteins and amino acids - general metabolism of different amino acids – Amino acid breakdown (amino acid deamination, Urea cycle, metabolic breakdown of individual amino acids – glucogenic & ketogenic amino acids), amino acids as biosynthetic precursors (haem biosynthesis & degradation, biosynthesis of epinephrine, dopamine, serotonin, GABA, histamin, glutathione); biosynthesis of essential & non-essential amino acids

### UNIT-IV

**12 Hours**

Chemistry and metabolism of nucleic acids- Definition -Importance - properties of nucleic acids, purine and pyridine metabolism.

### Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question-Answer

### Suggested readings

- *Champe, P. C., Harvey, R. A., & Ferrier, D. R. (2005). Biochemistry. Lippincott Williams & Wilkins.*
- *Ferrier, D. R. (2014). Biochemistry. Lippincott Williams & Wilkins.*

- *Varley, H. (1954). Practical clinical biochemistry. Practical clinical biochemistry.*
- *Lucock, M. (2000). Folic acid: nutritional biochemistry, molecular biology, and role in disease processes. Molecular genetics and metabolism, 71(1-2), 121-138.*
- *Nelson, D. L., Lehninger, A. L., & Cox, M. M. (2008). Lehninger principles of biochemistry. Macmillan.*
- *Vasudevan, D. M., Sreekumari, S., & Vaidyanathan, K. (2013). Textbook of biochemistry for medical students. JP Medical Ltd.*

**Course Title: Immune-hematology**

**Course Code: MHB107**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr.</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Total Hours: 45**

**Learning Outcomes:** After completion of this course, the learners will be able to

- Describe about immune system, antigens, antibodies, immunoglobulin, monoclonal antibodies, and immunoglobulin and their structure and function.

- Develop skills in managing patients with immune hematologic disorders including assessing disease severity, monitoring treatment responses, and addressing complications.
- Acquire proficiency in laboratory techniques used to diagnose immune hematologic disorders, such as Direct Anti globulin Test (DAT) Indirect Anti globulin Test (IAT), Flow cytometry, and molecular diagnostics.
- Perform routine hematological tests and collection of specimens, reception and labeling and recording of laboratory investigations.

### **Course Contents**

#### **UNIT-I**

**10 Hours**

Immune System: Introduction and overview on innate and adaptive immunity, primary and secondary lymphoid tissues and organs, cells of immune system.

Antigens: Factors responsible for immunogenicity, immunogen, hapten and adjuvant, epitopes, heterophile antigen, super antigen. Antibodies: Structure and function of immunoglobulin, monoclonal antibodies, immunoglobulin genes, generation of antibody diversity, immunoglobulin super family

#### **UNIT-II**

**12 Hours**

Blood Components and Functions: Blood composition and functions of different blood components, Haematopoiesis and erythropoiesis, Blood groups and typing, Blood Transfusion Basics: Transfusion reactions and their management, Blood Transfusion Practices: Pre-transfusion testing and patient identification, Blood product administration and monitoring

#### **UNIT-III**

**14 Hours**

Blood donor selection and screening, Blood collection, processing, and storage, Transfusion-related infections and complications, Blood Group Systems and Typing: ABO and Rh blood grouping systems, other important blood group systems (e.g., Kell, Duffy, Kidd, etc.) Blood typing techniques and interpretation of results. Compatibility Testing and Cross matching: Principles of compatibility testing, Cross matching procedures (major and minor cross match), Quality control and quality

assurance in blood transfusion services, Blood bank safety protocols and standard operating procedures, Regulatory and accreditation standards for blood banks.

#### UNIT-IV

**11 Hours**

Immune Hematology: Autoimmune and allo-immune haemolytic anaemias, Hemolytic disease of the foetus and new-born (HDFN), Transfusion-related immune complications (e.g., transfusion-associated graft-versus-host disease, alloimmunization), Transfusion-Transmitted Infections: Screening and testing for infectious diseases in donated blood, Common transfusion-transmitted infections (e.g., HIV, hepatitis B and C, syphilis, malaria), Strategies for prevention and control of transfusion-transmitted infections

#### Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question-Answer

#### Suggested Readings

- *Brown, A., & Smith, H. (2014). Benson's Microbiological Applications, Laboratory Manual in General Microbiology, Short Version. McGraw-Hill Education.*
- *Brown, A., & Smith, H. (2014). Benson's Microbiological Applications, Laboratory Manual in General Microbiology, Short Version. McGraw-Hill Education.*
- *E Brown, A. (2001). Benson's Microbiological Applications Laboratory Manual in General Microbiology-Alfred E Brown.*
- *Tortora, G. J., Funke, B. R., Case, C. L., Weber, D., & Bair, W. (2004). Microbiology: an introduction (Vol. 9). San Francisco, CA: Benjamin Cummings.*
- *Parija, S. C. (2013). Textbook of Microbiology & Immunology-E-book. Elsevier Health Sciences.*
- *Murray, P. R., Rosenthal, K. S., & Pfaller, M. A. (2020). Medical microbiology E-book. Elsevier Health Sciences.*
- *Sachais, B. S., & Slichter, S. J. (2021). The scientific basis for platelet transfusion: Current practice and future prospects. CRC Press.*
- *Vamvakas, E. C., & Blajchman, M. A. (2008). Transfusion-related immunomodulation (TRIM): An update. Blood Reviews, 22(4), 203-217.*

**Course Title: Blood donation and blood components**

**Course Code: MHB108**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr.</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Total Hours: 45**

**Learning Outcomes:** After completion of this course, the learners will be able to

- Appreciating the importance of blood donation; recognizing the critical role of blood donation in health care, emergency situations, surgeries and treatment of various diseases
- Learning about the steps involved in blood donation including registration, medical screening, the actual donation and post donation care
- Identifying the different types of blood cells including RBS, WBCS and platelets.
- Understanding the significance of blood type compatibility in transfusions to prevent adverse reactions.

### **Course Content**

#### **UNIT-I**

**14 Hours**

Donor Motivation, Motivational Techniques, Social Marketing, Preparation of IEC Materials Donor recruitment & Retention: Types of blood donors, Donor selection, medical interview and medical examination, screening for haemoglobin estimation Managing rejected blood donors, technique for conversion of first time donor into regular voluntary donor, donor felicitation

#### **UNIT-II**

**14 Hours**

Blood collection room equipment, their principles, and use, emergency medicines, Pre donation counseling, bleeding of the donor, post donation care, post donation counseling. Screening of blood units for mandatory tests, discarding infected units, Blood Donation drive: Awareness programs prior

to blood donation drive, Camp site, staff requirement, management of camp, transportation of blood units from camp site to blood bank Preservation of donated blood, blood preservation solutions, additive solutions

**UNIT-III**

**17 Hours**

Apheresis procedures, Apheresis products, preparation of multiple products on cell separators, Maintenance of cell separator equipment Autologous blood donation Selection of blood bags for component preparation, preparation of red cell concentrate, Fresh Frozen plasma, platelet concentrate, cryoprecipitate, washed red cells, Frozen red cells Plasma Fractionation: Principles, manufacturing of different plasma derivatives Component Testing, Labeling, transportation and storage of blood components. Preparation of leukoreduced blood products, Leukocyte filters, component extractors. Metabolic changes in blood components during storage, release of cytokine during storage

**Transactional modes**

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

**Suggested Readings**

- *Overfield, J., Dawson, M. and Hamer, D., 2008. Transfusion science. Bloxham, Oxfordshire: Scion*
- *Sachais, B. S., & Slichter, S. J. (2021). The scientific basis for platelet transfusion: Current practice and future prospects. CRC Press.*
- *Vamvakas, E. C., & Blajchman, M. A. (2008). Transfusion-related immunomodulation (TRIM): An update. Blood Reviews, 22(4), 203-217.*
- *Bishop, M. L., Fody, E. P., & Schoeff, L. E. (2013). Clinical chemistry: principles, techniques, and correlations. Lippincott Williams & Wilkins.*

**Course Title: Medical Laboratory Management**

**Course Code: MHB109**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr.</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Total Hours 45**

**Course Learning Outcomes:** After completion of this course, the learners will be able to

1. Understand the organizational structure and functions of a medical laboratory.
2. Apply quality management principles and tools to ensure accurate and reliable laboratory results.
3. Demonstrate knowledge of financial management techniques specific to medical laboratories.
4. Comply with relevant regulations, accreditation standards, and ethical considerations in laboratory management

### **Course Contents**

#### **UNIT-I**

**10 Hours**

Introduction to Medical Laboratory Management Definition and scope of medical laboratory management, Roles and responsibilities of a laboratory manager, Trends and challenges in laboratory management, Laboratory Organization and Workflow

#### **UNIT-II**

**15 Hours**

Organizational structures in medical laboratories, Laboratory workflow and process optimization, Equipment and inventory management

Quality Management Systems, Introduction to quality management in laboratories, Quality control and assurance, Accreditation and regulatory requirements, Risk management and error prevention, Financial Management in Medical Laboratories

#### **UNIT-III**

**10 Hours**

Budgeting and financial planning, Cost analysis and pricing of laboratory services, Reimbursement systems and insurance considerations, Revenue cycle management, Human Resource Management, Recruitment, training, and development of laboratory staff, Performance evaluation and staff motivation, Teamwork and effective communication

#### **UNIT-IV**

**10 Hours**

Compliance with relevant laws and regulations (e.g., HIPAA), Ethical considerations in laboratory management, Data privacy and security

Strategic Planning and Continuous Improvement, developing a strategic plan for a medical laboratory, Monitoring and improving laboratory performance

Implementing change and innovation

#### **Transactional modes**

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

**Suggested Readings**

- *Harr, R. B. (2016). Medical Laboratory Management and Supervision: Operations, Review, and Study Guide (2nd ed.). American Society for Clinical Pathology Press.*
- *O'Connor, M. L., & Williams, A. (2019). Clinical Laboratory Management (2nd ed.). Elsevier.*
- *Garza, D., & Becan-McBride, K. (2015). The Laboratory Manager's Handbook (4th ed.). ASQ Quality Press.*
- *Vallero, D. A. (2017). Clinical Laboratory Management: A Guide for Clinical Laboratory Scientists. CRC Press.*
- *Mayo Clinic (Eds.). (2016). Mayo Clinic Medical Laboratory Science and Pathology Board Review (3rd ed.). Oxford University Press.*

**2nd Semester****Course Title: Advance Hematology****Course Code: MHB201**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr.</b>
<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

**Total Hours 60****Course Learning Outcomes:** After completion of this course, the learners will be able to



- 1 Identify and differentiate various pathological conditions based on laboratory findings
- 2 Interpret and analyze laboratory results, including hematological, biochemical, and immunological tests.
- 3 Understand the principles and techniques of clinical pathology for accurate diagnosis and monitoring of diseases.
- 4 Apply quality control measures and ensure safety in clinical laboratory practices.

### **Course Contents**

#### **Unit I**

**14 Hours**

Constituents of blood and bone marrow, Regulation of hematopoiesis. Anemia: classification and clinical features; clinical and lab. approach to diagnosis Pathology. Nutritional anemias: Iron deficiency anemia, Folic Acid/Vit B 12 deficiency anemia including pernicious anemia. Hemolytic Anemias: Classification and investigation.

#### **Unit II**

**16 Hours**

Hereditary hemolytic anemias: Thalassemia, sickle cell anemia Hereditary hemolytic anemias: hereditary spherocytosis, G-6-PD deficiency Acquired hemolytic anemias, Hemolytic Anemias: Autoimmune, Alloimmune, Hemostatic disorders: Platelet deficiency; ITP, Drug induced, secondary k) Coagulopathies: Coagulation factor deficiency; hemophilia. Leukocytic disorders: Leukocytosis, leukopenia, Acute and chronic Leukemia: Classification, Diagnosis.

#### **Unit III**

**14 Hours**

Blood transfusion: grouping and cross matching, untoward reactions, transmissible infections including HIV and hepatitis. Infectious diseases, new and emerging infectious diseases, categories of infectious diseases in brief, Special techniques for diagnosing infections, Tuberculosis-etiology, pathogenesis and lab diagnosis, Leprosy – etiology, pathogenesis and lab diagnosis, HIV- epidemiology, pathogenesis and lab diagnosis.

#### **Unit IV**

**16 Hours**

Classification and Laboratory diagnosis of Hemolytic anemia. Definition, classification and laboratory diagnosis of Leukemia. Chromosomal studies in various hematological

disorders and their significance. Laboratory diagnosis of bleeding disorders with special emphasize to Hemophilia A, B & Von-Willebrand disease DIC. Platelet disorder (Qualitative and quantitative) Laboratory approach for investigating thrombosis. Using radioisotopes measurement of: Blood volume, Determination of Red cell volume and Plasma volume, Red cell life span, Platelet life span

**Transactional modes**

Video based teaching, Collaborative teaching, Case based teaching, Question-Answer

**Suggested Readings**

- *Kumar, V., Abbas, A. K., & Aster, J. C. (2014). Robbins and Cotran pathologic basis of disease. Elsevier Health Sciences.*
- *Henry, J. B. (Ed.). (2011). Clinical diagnosis and management by laboratory methods. Saunders.*
- *Jaffe, E. S., Harris, N. L., Vardiman, J. W., & Campo, E. (Eds.). (2016). Hematopathology. Elsevier Health Sciences.*
- *McClatchey, K. D. (Ed.). (2018). Clinical laboratory medicine. Wolters Kluwer.*
- *Rodak, B. F., & Carr, J. H. (2019). Clinical hematology atlas. Elsevier Health Sciences.*
- *Bishop, M. L., Fody, E. P., & Schoeff, L. E. (2013). Clinical chemistry: principles, techniques, and correlations. Lippincott Williams & Wilkins.*
- *Text book of Medical Laboratory Technology by Paraful B. Godkar*
- *Medical laboratory Technology by KL Mukherjee Volume-I*
- *Practical Haematology by JB Dacie*
- *Clinical Diagnosis & Management by Laboratory methods (20th edition) by John Bernard Henry*
- *Atlas of Haematology (5th edition) by G.A. McDonald*
- *De Gruchy's clinical Haematology in medical practice*

**Course Title: Transfusion Medicine**

**Course Code: MHB202**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr.</b>
<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

**Total Hours 60**

**Course Learning Outcomes:** After completion of this course, the learners will be able to

1. Understand the basic concepts of blood banking and transfusion medicine.
2. Perform and interpret routine blood bank tests and procedures.
3. Identify blood groups, antibodies, and antigens involved in blood transfusion.
4. Demonstrate knowledge of blood component preparation and storage.

### **Course Contents**

#### **UNIT-I**

**15 Hours**

Introduction to Blood Banking, History and evolution of blood banking, Role and responsibilities of a blood bank technologist, Regulatory and ethical considerations in blood banking, Quality assurance and quality control in blood banking, Standard operating procedures (SOPs) and documentation, Blood bank safety measures and infection control.

#### **UNIT-II**

**15 Hours**

Blood Collection and Processing, Blood collection techniques and anticoagulants, Blood component separation and processing methods, Donor screening and blood donor selection criteria, Transfusion guidelines and protocols, Documentation and record-keeping in blood transfusion

#### **UNIT-III**

**15 Hours**

Blood Group Systems, ABO and Rh blood group systems, Other significant blood group systems (Kell, Duffy, etc.) Inheritance patterns and clinical significance of blood groups, Immunological and non-immunological adverse reactions, Blood bank organization and staffing.

#### **UNIT-IV**

**15 Hours**

Blood Components and Storage, Preparation and storage of packed red blood cells (PRBCs), Platelet concentrates and cryoprecipitate preparation, Fresh frozen plasma (FFP) and other blood components, Haemolytic disease of the foetus and new-born (HDFN), Transfusion support in patients with autoimmune disorders

#### **Transactional modes**

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

#### **Suggested Readings**

- *Lewis, S. M., Bain, B. J., Bates, I., &Dacie, J. V. (2001). Dacie and Lewis practical haematology.London: Churchill Livingstone*

- *Lawicki, S., Covin, R. and Powers, A., 2017. The Kidd (JK) Blood Group System. Transfusion. Medicine Reviews, 31(3), pp.165-172.*
- *Lazarus, H. and Schmaier, A., 2012. Concise guide to hematology. Chichester, West Sussex, UK: Wiley-Blackwell, pp.77-81.*
- *Overfield, J., Dawson, M. and Hamer, D., 2008. Transfusion science. Bloxham, Oxfordshire: Scion.*

**Course Title: Transfusion Reactions and Complications****Course Code:MHB203**

L	T	P	Cr.
4	0	0	4

**Total Hours 60****Course Learning Outcomes:** After completion of this course, the learners will be able to:

- Ability to identify signs and symptoms of different types of transfusion reactions like acute hemolytic reaction, febrile non-hemolytic reaction, allergic reaction etc.
- Knowledge of the immunological and non-immunological mechanisms that can lead to transfusion reactions.
- Understanding of proper techniques for administering blood and blood products.
- Knowledge of post-reaction assessments to monitor patient status and ensure resolution of the reaction.

**Course Contents****Unit-I****16 Hours**

Blood donation, Motivating factors for donation Whole blood donation Vs apheresis donation Types: allogeneic, autologous, directed Donor questionnaire and interview: Eligibility and deferral criteria Donor reactions and their management Blood Component Preparation, Basic steps in component preparation & labeling Composition: volume, cellular, plasma and clotting factor content Storage conditions for components “Storage lesions” Quality control standards Specialized blood components – irradiated, volume reduced, CMV free, HLA matched.

**Unit-II****14 Hours**

Pretransfusion testing Patient specimen labeling requirements Patient / component identification requirements ABO / Rh, Red cell antibody screen, Cross match Abbreviation of compatibility testing in emergency, Transfusion indications Red blood cells, Platelets, Plasma / cryoprecipitate, Granulocytes, Massive transfusion Metabolic complications Dilutional coagulopathy Switching ABO / Rh types, Massive transfusion Metabolic complications Dilutional coagulopathy Switching ABO / Rh types

**Unit-III****16 Hours**

Transfusion reactions: Diagnosis, pathophysiology, Treatment, Prevention, Infectious complications: Bacterial, parasitic, viral, prions, Current risk & Prevention strategies, Adverse effects of transfusion, Recognition, testing, treatment, prevention strategies for hemolytic transfusion reaction, allergic anaphylactoid reaction, Clotting factor disorders: Principle of hemostasis & coagulation, Lab tests of coagulation status, Selection and dosage of factor preparations, Management of patients with inhibitors,

Transfusion alternatives: Synthetic and natural volume expanders, Hemoglobin solution, Perfluorochemicals, Fibrin glue, Hemostatic agent

**Unit-IV**

**14 Hours**

Transfusion therapy in special patients, Hematology / Oncology, Pediatric / neonatal, Obstetric including intra uterine, Cardiac surgery with CPB, Burn patients & Trauma patients, Transplantation: Stem cell / Bone marrow, Liver, Kidney, Hemolytic disease of newborn, Pathophysiology, Causative blood group antibodies, Treatment & Prophylaxis, Hemoglobinopathy, Classification, Pathophysiology, Diagnosis & Transfusion therapy

**Transaction Modes**

Video based teaching, Collaborative teaching, Case based teaching, Question-Answer

**Suggested Readings**

- *Blood transfusion in clinical medicine, Ed. Pl mollison, 8th edition, Blackwell Sci.Pub. Oxford.*
- *Transfusion Medicine, Ed. WH churchill, SR Kurtz, Blackwell Sci, Pub, Oxford, 1988*
- *Clinical Practice of Transfusion Medicine, Ed. L Petz, Swisher, 2nd edition, Curchill Livingstone, New York, 1989.*
- *Blood transfusion therapy: A problem oriented approach, Ed. JAF napier, John, Willey & sons, Chichester, 1987*

**Course Title: Advance Hematology (Practical)**

L	T	P	Cr.
0	0	4	2

**Course Code: MHB204****Total Hours 30****Course Learning Outcomes:** After completion of this course, the learners will be able to:

1. Ability to prepare high quality blood smears for microscopic examination
2. Skill in accurately identifying and differentiating between various types of blood cells, including RBCS, WBCS, and platelets
3. Recognize normal and abnormal test results and correlate these data with appropriate pathologic conditions to accurately advise health care providers.
4. Adapt laboratory techniques and procedures when errors and discrepancies in results are obtained to effect resolution in a professional and timely manner.

**List of Practical's / Experiments****30 Hours**

1. Study and interpretation of Histogram of Automated Blood cell counter
2. To estimate serum iron and total iron binding capacity.
3. Screening tests for enzymes deficiency: Pyruvate Kinase, G6PD
4. To estimate Hb-F, Hb-A2 in a given blood sample.
5. To estimate plasma and urine Hemoglobin in the given specimens.
6. To demonstrate the presence of Hb-S by Sickling and Solubility tests.
7. Perform Hb electrophoresis (alkaline)
8. Perform osmotic red cell fragility.
9. Detection of Fibrin degradation products (FDPs)
10. To perform various platelet function tests such as whole blood clot retraction test, prothrombin consumption index (PCI) Platelet adhesion, aggregation and PF3 availability test.
11. Estimation of Protein C, S
12. Peripheral Blood Lymphocyte Culture for chromosome studies in Leukemia.
13. To demonstrate BT, CT, PT, INR, APTT, TT.
14. To demonstrate Mixing experiments.
15. Tests of D-Dimers and Assay of Coagulation factors.

**Transactional modes**

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

### **Suggested Readings**

- *Wintrobe clinical haematology Vol- I - 10th edition*
- *Wintrobe clinical haematology Vol- II -10th edition*
- *Lynch's Medical Lab - Technology Latest edition*
- *Clinical Diagnosis & Management - Todd & Sanford 19th edition 1996*
- *Medical Laboratory Technology by Sood 5th edition, Jaypee Brothers 1999*
- *Clinical Haematology in Medical Practice - G.C. Degruchy - 5th edition*



**Course Title: Transfusion Medicine (Practical)**

**Course Code: MHB205**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr.</b>
<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**Total Hours 30**

**Course Learning Outcomes:** On completion of this course, the successful students will be able to:

5. Apply advanced blood bank and blood transfusion knowledge to make appropriate and effective on-the-job professional decisions.
6. Perform and interpret commonly utilized procedures in the blood bank laboratory.
7. Recognize normal and abnormal test results and correlate these data with appropriate pathologic conditions to accurately advise health care providers.
8. Adapt immunohematology laboratory techniques and procedures when errors and discrepancies in results are obtained to effect resolution in a professional and timely manner.

**List of Practical's / Experiments**

**30 Hours**

1. Safety precautions in the blood bank laboratory
2. Identification and labeling of blood samples
3. Aseptic techniques in blood collection
4. Blood group typing techniques (ABO and Rh systems), cross matching techniques
5. Blood transfusion reactions and their management
6. Blood Component Preparation and Storage
7. Preparation of packed red blood cells (PRBCs)
8. Preparation of fresh frozen plasma (FFP)
9. Blood component storage and transportation
10. Quality control and quality assurance in blood component preparation
11. Donor selection criteria
12. Venipuncture techniques for blood collection, Donor adverse reactions and their management
13. Screening tests for transfusion-transmitted infections (HIV, Hepatitis B and C, syphilis, etc.)

**Transactional modes**

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

## Suggested Readings

- Lewis, S. M., Bain, B. J., Bates, I., & Dacie, J. V. (2001). *Dacie and Lewis practical haematology*. London: Churchill Livingstone
- Lawicki, S., Covin, R. and Powers, A., 2017. *The Kidd (JK) Blood Group System*. *Transfusion Medicine Reviews*, 31(3), pp.165-172.
- Lazarus, H. and Schmaier, A., 2012. *Concise guide to hematology*. Chichester, West Sussex, UK: Wiley-Blackwell, pp.77-81.
- Overfield, J., Dawson, M. and Hamer, D., 2008. *Transfusion science*. Bloxham, Oxfordshire: Scion.

**Course Title: Quality Assurance And Patient Safety****Course Code: MHB206**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr.</b>
<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>

**Total Hours 30****Learning Outcomes:** After completion of this course, the learners will be able to

1. They will get the knowledge about the health care discipline that emerged with the evolving complexity in health care systems and the resulting rise of patient harm in health care facilities.
2. Students will get to know the ways to prevent and reduce risks, errors and harm that occur to patients during provision of health care.
3. This subject is continuous improvement based on learning from errors and adverse events.
4. Important role in Quality improvement approaches, standards and norms.

**Course Contents****UNIT-I****8 Hours**

Quality assurance and Management Introduction, Quality improvement approaches, standards and norms, quality improvement tools, introduction to NABH guidelines. Basic of Emergency care and Life support skills Basic life support (BLS) following cardiac arrest, recognition of sudden cardiac arrest and activation of emergency response system, early cardiopulmonary resuscitation (CPR) and rapid defibrillation with an automated external defibrillator (AED)

**UNIT-II****6 Hours**

Basic emergency care First aid, choking, rescue breathing methods, ventilation including use of bag valve masters (BVMs) Biomedical Waste Management Definition, waste minimization.

**UNIT-III****8 Hours**

BMW-segregation, collection, transportation, treatment and disposal (Including color coding), Liquid BMW, Radioactive waste, metals/chemicals/drug waste, BMW management and methods of disinfection, use of Personal protective equipment (PPE), Infection Prevention and Control, Sterilization, Disinfection, Effective hand hygiene, use of PPE,

## **UNIT-IV**

**8 Hours**

Prevention and control of common health care associated infections, Guidelines (NABH) and JCI for hospital infection control. Disaster preparedness and management Fundamentals of emergency management

### **Transactional modes**

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

### **Suggested Readings**

- *Vincent, C. (2011). Patient safety. John Wiley & Sons.*
- *Hall, L. M. (Ed.). (2005). Quality work environments for nurse and patient safety. Jones & Bartlett Learning.*
- *Sandars, J., & Cook, G. (Eds.). (2009). ABC of patient safety (Vol. 72). John Wiley & Sons.*
- *Carayon, P. (2006). Handbook of human factors and ergonomics in health care and patient safety. CRC press.*

**Course Title: Quality Control in Hematology**

**Course Code: MHB207**

L	T	P	Cr.
3	0	0	3

**Total Hours 45**

**Learning Outcomes:** After completion of this course, the learners will be able to

1. Knowledge of the accrediting bodies and agencies like Clinical Laboratory Improvement Amendments – CLIA and College of American Pathologists - CAP that set the standards for hematology laboratories.
2. Familiarity with the various hematological parameters measured in a complete blood count (CBC) and their clinical significance (e.g., red blood cell count, white blood cell count, hemoglobin, hematocrit, platelet count, etc.)
3. Ability to operate and maintain hematology analyzers and associated equipment to ensure proper functioning and accurate results
4. Knowledge of quality control materials (e.g., commercial controls, in-house controls) and the procedures for using them to monitor the accuracy and precision of laboratory tests.

### **Course Contents**

#### **UNIT-I**

**15 Hours**

Quality control of blood grouping reagents, QC of anti-human globulin reagent, bovine albumin, normal saline, quality control of blood bags, quality control of different blood banks components, sterility test on computer

#### **UNIT-II**

**15 Hours**

Calibration, validation and maintenance of blood bank equipment, QC of blood bank techniques, internal and external QC, Organization of blood bank services, Blood Bank premises and infrastructure, regional blood transfusion Centre and blood storage Centre, blood bank management system.

#### **UNIT-III**

**15 Hours**

Regulations for blood bank operation: Drugs and cosmetics Law, National blood policy, standards in Blood Banking, licensing procedures. Recruitment and training of blood bank personnel, Proficiency testing. Blood Bank Accreditation, Automation in Blood Banking, Nucleic Acid Testing, Apheresis , Stem Cells.

## **Transactional modes**

Video based teaching, Collaborative teaching, Case based teaching, Question-Answer

## **Suggested Readings**

- *Hematology: Basic Principles and Practice" by Ronald Hoffman, Edward J. Benz, et al.*
- *"Rodak's Hematology: Clinical Principles and Applications" by Elaine Keohane, Larry Smith, et al.*
- *Hematology: Clinical Principles and Applications" by Bernadette F. Rodak and George A. Fritsma –*
- *Hemostasis and Thrombosis: Basic Principles and Clinical Practice" by Robert W. Colman, et al.*
- *"Quality Management in the Medical Laboratory: A Case Study Approach" by Linda M. Sandhaus*

**Course Title: Recent Advances in Blood Banking****Course Code: MHB208**

L	T	P	Cr.
3	0	0	3

**Total Hours 45****Learning Outcomes:** After completion of this course, the learners will be able to

1. Familiarity with modern techniques like molecular typing and extended antigen matching, which enhance the precision of blood compatibility testing.
2. Understanding the principles and benefits of pathogen reduction methods, which enhance the safety of blood components.
3. Awareness of the pivotal role blood banks play in disaster management, including stockpile management, rapid deployment, and response coordination.
4. Understanding the ethical dilemmas and considerations surrounding issues like patient autonomy, informed consent, and resource allocation

**Course Contents****Unit-I****15 Hours**

Automation and Computerization in blood bank services, Automated blood grouping & processing Automation in TTI testing Instrumentation & use of bar codes Use of computers in blood banking including Implementation of Blood Establishment Computer Software (BECS).

**Unit-II****15 Hours**

Recent Advances in Blood Banking Latest trends in blood banking- Donor screening, retention, Blood collections, components etc. Recent advances in Automation of Blood Banking. Recent advances in apheresis procedures Nucleic Acid Testing. Stem Cells & Cord stem cell banking. Artificial blood

**Unit-III****15 Hours**

Stem cell Preparation and Banking Stem cell- Cord blood, Peripheral blood Hematopoietic stem cell Stem cell banking and application. Procedures of collection of stem cell and calculation of stem cell collected, Quality control of products, Cryopreservation, maintenance, QC and thawing procedures in stem cell banking, Regenerative medicine. Ethical guidelines Concept of Bio banking 30 157 P

**Transactional modes**

Video based teaching, Collaborative teaching, Case based teaching, Question-Answer

**Books Suggested**

- *Transfusion Medicine and Hemostasis: Clinical and Laboratory Aspects" by Christopher D. Hillyer, Beth H. Shaz, et al.*
- *"Immunohematology and Transfusion Medicine: A Case Study Approach" by Connie M. Westhoff*
- *"Blood Transfusion Therapy: A Physician's Handbook" by Richard Kaufman, Edward L. Snyder, et al.*

- *Patient Blood Management: From Principles to Practice" by Aryeh Shander, Jean-Francois Hardy, et al.*
- *Blood Banking and Transfusion Medicine: Basic Principles and Practice" by Christopher D. Hillyer, et al*



**Course Title: Clinical Microbiology****Course Code:MHB209**

L	T	P	Cr.
3	0	0	3

**Total Hours: 45****Learning Outcomes:** After completion of this course, the learners will be able to

1. Recognition and description of different types of microorganisms (bacteria, fungi, viruses, parasites) and their cellular structures.
2. Proficiency in various microbiological techniques like staining, culturing, biochemical testing, and molecular methods for the isolation and identification of microorganisms.
3. Knowledge of infection control protocols to prevent the spread of infectious agents within healthcare settings.
4. Understanding the modes of transmission and epidemiology of infectious diseases to implement effective control measures.

**Course Contents****Unit-I****15 Hours**

History of microbiology – classification of microorganism – Prokaryotes and Eukaryotes Morphology of bacteria – size, shape and arrangement of bacterial cell – cell wall, cytoplasmic membrane, flagella, fimbriae and pili, cytoplasmic matrix, nucleoid, cytoplasmic inclusions. Bacteria – Bacterial growth curve, growth requirements. Stains –simple stains, negative stain, differential stains and special stains. Sterilization and disinfection – Definition, physical agents – (sunlight, Drying, Dry heat, Moist heat, filtration, Radiation, Ultrasonic and sonic vibration) Chemical- (Alcohols, Aldehydes, Dyes, Halogens, Phenols, Gases) Culture methods (streak culture, Pour plate culture, Stab culture, anaerobic culture methods), colony count

**Unit-II****15 Hours**

Identification of bacteria sero-typing and sub-typing, phage typing, Bacterial genetics- methods of gene transfer – Transformation-mechanism, natural and artificial, Transduction-mechanism, generalized and specialized transduction, lysogenic conversion, Conjugation-Properties of F-plasmid, HFr strains, col factor, Mechanism, Antibacterial antibiotics and their mode of action, Normal bacterial flora of human body, Automation in microbiology, Quality control in clinical microbiology laboratory.

**Unit-III****15 Hours**

Sterilization and disinfection: Introduction, types, mode of action and application of sterilization by physical and chemical method, Testing for the potency of disinfectants including Minimum inhibitory concentration test, Rideal-Walker test, Chick-Martin, and Garrod test, Capacity use dilution test, Stability test, In-use test and test for disinfecting action on surfaces. Collection, transportation, preservation, storage, and processing of clinical specimens for aerobic and anaerobic culture, Methods of anaerobiosis: Displacement of oxygen,

Absorption of oxygen, Displacement and combustion of oxygen, Biological method, and incorporating reducing agents in culture media.

### **Transaction Modes**

Video based teaching, Collaborative teaching, Case based teaching, Question-Answer

### **Suggested Readings**

- *Textbook of Diagnostic Microbiology, Connie R. Mahon MS*
- *Koneman's Color Atlas and Textbook of Diagnostic Microbiology, Gary W. Procop*
- *Jawetz, Melnick & Adelbergs Medical Microbiology, Stefan Riedel, Stephen Morse, Timothy Mietzner, Steve Miller*
- *Medical Microbiology, Patrick R. Murray Ph.D., Ken S. Rosenthal Ph.D., Michael A. Pfaller MD*
- *Brock Biology of Microorganisms, Michael Madigan, Kelly Bender, Daniel Buckley, W. Sattley), David Sta*

**Course Title: Blood Banking and Human Genetics****Course Code: MHB210**

L	T	P	Cr.
3	0	0	3

**Total Hours 45****Learning Outcomes:** After completion of this course, the learners will be able to

1. Proficiency in various blood collection methods, including venipuncture and donor screening procedures
2. Skill in performing ABO and Rh blood typing, cross-matching, and antibody screening to ensure safe transfusions.
3. Recognition and interpretation of chromosomal abnormalities and their clinical implications.
4. Ability to provide information and support to individuals and families affected by genetic disorders.

**Course Contents****UNIT I****15 Hours**

Introduction to Blood Banking, History and discovery of various blood group systems, ABO blood group system, Rh and other major blood group system, Sources of error in blood grouping and their elimination, ABO grouping: Forward and reverse grouping. Causes of discrimination between forward and reverse grouping, Rh grouping. Compatibility test in blood transfusion, Collection of blood for cross matching from a blood bag, Major cross matching, Minor cross matching, Use of enzymes in blood bank specially Papain.

**UNIT II****15 Hours**

Complications and hazards of blood transfusion, Laboratory investigations of transfusion reactions and mismatched blood transfusion, Precautions while procurement and storage of grouping antisera. Various anticoagulants used to collect blood for transfusion purposes, Selection of donor and procedure for collection of blood from a healthy donor. Preparation of various fractions of blood for transfusion and therapeutic purposes such as: Packed red cells, washed red cells and FROZEN Red cells, Platelet Rich Plasma (PRP), Platelet concentrate and frozen platelets, Fresh plasma (FP), Fresh Frozen Plasma (FFP) and cryoprecipitate, Brief introduction of blood substitute/artificial blood, Haemopheresis, pertaining to Leucocytes, platelets and plasma, Quality control in blood bank.

### **UNIT III**

**15 Hours**

Continuity of life-heredity, variation, Mendel's laws of inheritance, Chromosomal basis of inheritance; other patterns of inheritance-incomplete dominance, multi parallelism, quantitative inheritance, Chromosomes - bacterial cell and eukaryotic cell; parallelism between genes and chromosomes; genome, linkage and crossing over; gene mapping; recombination, Molecular genetics: DNA as a genetic material- its structure and replication; structure of RNA and its role in protein synthesis, Vectors, plasmids, Human Genetics, Microbial genetics.

#### **Transactional modes**

Video based teaching, Collaborative teaching, Case based teaching, Question-Answer

#### ***Suggested readings***

- *Technical Manual" by AABB, formerly known as the American Association of Blood Banks.*
- *Modern Blood Banking & Transfusion Practices by Denise M. Harmening*
- *Immunohematology: Principles and Practice by Eva D. Quinley*
- *Introduction to Genetic Analysis by Anthony J.F. Griffiths, Susan R. Wessler, Sean B. Carroll, and John Doebley*
- *Medical Genetics by Lynn B. Jorde, John C. Carey, and Michael J. Bamshad*
- *Genetics: Analysis and Principles by Robert J. Brooker*

**Semester 3<sup>rd</sup>****Course Title: Research Methodology****Course Code: MHB301**

L	T	P	Cr.
4	0	0	4

**Total Hours: 60**

**Course Learning Outcomes:** After successful completion of this course, the learners will be able to:

1. Prioritize the needs of research in the clinical field of Radiology.
2. Choose the appropriate research design and develop appropriate research hypothesis for a research project.
3. Describe the appropriate statistical methods required for a particular research design
4. Develop the ability to apply the methods while working on a research project work

**Course Contents****UNIT I****15 Hours**

Research: its concept, nature, scope, need and Objectives of Research, Research types, Research methodology, Research process – Flow chart, description of various steps, Selection of research problem.

**UNIT-II****15 Hours**

Research Design: Meaning, Objectives and Strategies of research, different research designs, important experimental designs, Methods of Data Collection and Presentation: Types of data collection and classification, Observation method, Interview Method, Collection of data through Question-Answernaires, Schedules, data analysis and interpretation, editing, coding, content analysis and tabulation.

**UNIT-III****15 Hours**

Sampling Methods: Different methods of Sampling : Probability Sampling methods , Random Sampling, Systematic Sampling, Stratified Sampling, Cluster Sampling and Multistage Sampling. Non probability Sampling methods, Sample size.

**UNIT-IV****15 Hours**

Report writing and Presentation: Types of reports, Report Format – Cover page, Introductory page, Text, Bibliography, Appendices, Typing instructions, Oral Presentation

**Transactional modes**

Video based teaching, Collaborative teaching, Case based teaching, Question-Answer,

**Suggested Readings**

- Panneerselvam, R, 'Research Methodology', PHI, New Delhi.
- Cooper, D.R.,Schindler,P.S., 'Business Research Methods,' Tata McGraw Hill Gupta S P, 'Statistical Methods', Sultan Chand & Sons, Delhi Ronald E Walpole, 'Probability and Statistics for Engineers and Scientists' (International Edition) , Pearson Education. Geode, Millian J. & Paul K. Hatl, "Methods in Research", McGraw Hills, New Delhi.
- Kothari C.R., "Research Methodology", New Age Publisher Nargundkar R, Marketing Research, Tata McGraw Hill, New Delhi, 2002. Sekran, Uma, "Business Research Method", Miley Education, Singapore.
- <https://www.academia.edu/>
- <https://www.studeersnel.nl>
- <https://www.scribd.com>

**Course Title: Research Proposal****Course Code: MHB398**

L	T	P	Credits
0	0	8	4

**Learning Outcomes**

After completion of the course, the learner will be able to

1. Get deep insights to collect, review and analyze the related literature.
2. To apply the knowledge to formulate hypothesis & design research process.
3. Find the research titles which are significant, applicable and researchable.
4. Interpret the findings to design statistical strategies & write references, bibliography and webliography.

**Course Content**

A research proposal contains all the key elements involved in the research process and proposes a detailed information to conduct the research.

The students are supposed to prepare the research proposal of any research area of their choice following these steps:

1. Selection of topic
2. Significance of the research area
3. Formulation of hypothesis/Research questions
4. Review of related literature
5. Method & Procedure (Includes sampling & design)
6. Data collection and proposed statistical analysis
7. Delimitations
8. Reference/Bibliography

### **Evaluation**

The students will have to complete the writing process of each topic given above within one week, which will be evaluated at the end of every week. It will consist of 8 marks each. The final proposal shall be of 15 marks, Viva 16 marks and attendance 5 marks.

### **Transaction Mode**

Collaborative learning, Group Discussion, E team Teaching, Activities, Assessments, Collaborative teaching, Peer Teaching, Video Based Teaching, Quiz, Open talk, E team Teaching, Case analysis, Flipped Teaching

**Course Title: Ethics & IPR****Course Code: MHB303**

L	T	P	Cr.
2	0	0	2

**Total Hours: 30**

**Course Learning Outcomes:** On successful completion of this course, the students will be able to:

1. Explain different kind of ethics and values.
2. Apply professional ethics in business.
3. Explain the role of IPRs in professional life.
4. Elucidate the importance of patents and copyrights

### Course Contents

**UNIT I****07 Hours**

Ethics: definition, moral philosophy, nature of moral judgments and reactions, scope, Ethics with respect to science and research, Intellectual honesty and research integrity Scientific misconducts:

**UNIT II****08 Hours**

Falsification, Fabrication, and Plagiarism (FFP) Redundant publications: duplicate and overlapping publications, salami slicing, Selective reporting and Misrepresentation of data, Publication ethics: definition, introduction and importance.

**UNIT-III****08 Hours**

Introduction to Intellectual Property rights: Concept & theories, Kinds of intellectual Property Rights, Advantages & Disadvantages of IPR, Development of IPR in India, Role & Liabilities of IPRs in India.

**UNIT-IV****07 Hours**

Rights of trademark-kind of signs used as trademark-types, purpose & Functions of a trademark, trademark protection, trademark registration, selecting and evaluating trade mark, trade mark registration process.

**Transaction Mode-**

Video based teaching, collaborative teaching, case based teaching, Question-Answer

**Suggested Readings**

- *"Ethics: Theory and Practice"* by Jacques P. Thiroux and Keith W. Krasemann
- *"Practical Ethics"* by Peter Singer
- *"Understanding Intellectual Property Law"* by Donald S. Chisum, Tyler T. Ochoa, and Shubha Ghosh.
- *"Intellectual Property: Patents, Trademarks, and Copyrights"* by Richard Stim



**Course Title: PROFICENCY IN TEACHING****Course Code: MHB397**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
2	0	0	2

**Total Hours: 30****Learning Outcomes**

After completion of this course, the learner will be able to:

1. Design the learner-centered instructional plans and learning outcomes.
2. Apply innovative teaching strategies and technologies to engage learners.
3. Analyze the different assessment methods to evaluate student learning.
4. Reflect on teaching experiences and continuously improve teaching practices.
5. Develop effective communication and classroom management skills.

**Course content****UNIT I****10 Hours**

Overview of the course and its objectives – Specify 1-2 theories or give overview of theories of learning for teaching - Understanding the role of the teacher and student in the learning process - Writing clear and measurable learning outcomes -

Meaning Nature, definition, scope, and importance Pedagogy, Andragogy, and Heutagogy – Skills-based approach to teaching (Teaching skills), Micro-teaching, Macro teaching. Methods and approaches of teaching - CAM, Structure-function approach, Synthetic and Analytic approach, Jurisprudential inquiry model

**UNIT II****6 Hours**

Understanding the diverse needs and backgrounds of learners - Creating an inclusive and supportive learning environment - Facilitating active learning and student engagement strategies

Lectures, discussions, and demonstrations - Group work, collaborative learning, and cooperative learning - Problem-based learning, case studies, and simulations

**UNIT III****7 Hours**

Integrating technology tools into instruction – Online, blended learning, flipped learning, and M-learning approaches - Using educational software and platforms effectively

Formative and summative assessment methods – Difference between Assessment, Evaluation and Measurement, E-assessment tools,

**UNIT IV****7 Hours**

The importance of reflective practice in teaching - Self-assessment and evaluation of teaching effectiveness –Need for Professional development - Teaching in multicultural and international classrooms - Culturally responsive teaching practices

Meaning, Definition of teaching model - Assumptions, Importance, Role, and type of teaching models. Historical teaching model, Philosophical model of teaching

### **Transaction Mode**

Discussions, Case Studies, Microteaching, Classroom Observations, Peer Teaching: Video Analysis, Role-Playing, Lecture-cum-demonstration, Classroom Simulations, Reflective Journals/Blogs, Teaching Portfolios and Technology Integration, Flipped Teaching

### **Suggested Readings**

- *Ali, L. (2012). Teacher education. New Delhi: APH Publishing Corporation.*
- *Anandan, K. (2010). Instructional technology in teacher education. New Delhi: APH Publishing Corporation.*
- *Bruce R Joyce and Marsha Weil, Models of Teaching, Prentice Hall of India Pvt Ltd, 1985.*
- *Chalan, K. S. (2007). Introduction to educational planning and management. New Delhi: Anmol Publications Pvt. Ltd.*
- *Chand, T. (2008). Principles of teaching. New Delhi: Anmol Publications Pvt. Ltd.*
- *Chiniwar, P. S. (2014). The technology of teaching. New Delhi: Anmol Publications Pvt. Ltd.*
- *Curzon, L. B., & Tummons, J. (2004). Teaching in future education. U.S.A: Bloomsbury Academic Publications.*
- *Das, R.C. (1993): Educational Technology – A Basic Text, Sterling Publishers Pvt. Ltd.*
- *Evaut, M. The International Encyclopedia of Educational Technology.*
- *Gage NL, Handbook of Research on Teaching, Rand Mc Nally and Co., Chicago, 1968.*
- *Graeme, K. (1969): Blackboard to Computers: A Guide to Educational Aids, London, Ward Lock.*
- *Haas, K.B. and Packer, H.Q. (1990): Preparation and Use of Audio Visual Aids, 3rd Edition, Prentice Hall, Inc.*
- *Haseen Taj (2006):modern Educational Technology, Agra: H.P Bhargava Book House.*
- *Jarvis, M. (2015). Brilliant ideas for ICT in the classroom. New York: Routledge Publications.*

**Course Title: Service Learning**  
**Course Code: MHB396**

L	T	P	Cr.
0	0	4	2

### **Learning Outcomes**

On the completion of the course, the students will be able to

1. Participate in community activities to establish connections and build relationships.
2. Evaluate community needs through conversations with community members.
3. Develop and implement initiatives that address community needs.
4. Reflect on personal growth, community impact and ethical considerations related to service activities.

### **Course Content**

This course aims to engross students in meaningful service-learning activities that foster community linking. Students will actively participate in community-based projects, collaborate with community members and organizations and reflect on the impact of their service activities. Through this experiential learning approach, students will develop a deep understanding of community needs, build relationships with diverse stakeholders and contribute to community development. In this course, students are expected to be present in the community throughout the semester and reflect on their experiences regularly after working with them. The students will use experiential learning for providing service learning. They will be able to analyse and have understanding of the key theoretical, methodological and applied issues.

Select 10 community related activities which are to be performed in nearby villages. Students in groups of 8-10 shall work on one activity.

### **Evaluation Criteria**

1. Every activity shall be evaluated on the same day out of 10 marks.
2. Total 10 activities out of 100 shall be evaluated and submitted to Examination branch.

### **Activity Evaluation**

1. Type of activity- 2 marks
2. Participation of student- 2 marks
3. Engagement in the activity- 2 marks
4. Outcome of the activities- 2 marks
5. Attendance- 2 marks

**Transaction Mode**

Problem-solving learning, Blended learning, Gamification, Cooperative learning, Inquiry-based learning, Visualization, Group discussion, Experiential learning, Active participation.

**Course Title: Computer Lab**

**Course Code: MHB306**

L	T	P	Cr.
0	0	4	2

**Total Hours: 60**

**Course Learning Outcomes:** On successful completion of this course, the students will be able to:

1. Understand the concepts of computer system, Windows operating system, Internet, various storage devices and computer Networks, e-waste
2. Analyze various components and Input output devices used in a computer system.
3. Utilize various applications and software's used
4. Creating and manipulating presentation, views, and formatting and enhancing text, and slide with graphs

### Course Contents

#### UNIT I

**05 Hours**

Generating Charts/Graphs in Microsoft Excel, Power Point Presentation, Creating a new document with templates & Wizard, Word basics, Thesis Writing Formats & scientific editing tools. Style Formats (MLA & APA)

#### UNIT II

**05 Hours**

Using Words Drawing Features, Inserting Tables – (Adding, deleting, modifying rows and columns - merging & splitting cells), Using formulas in tables, Converting text to table and vice-versa, Mail Merge tool. Managing Workbooks, Working with Worksheets.

#### UNIT III

**10 Hours**

Introduction of Windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resize minimizing and maximizing, etc.). Introduction to MS- Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge.

## UNIT IV

10 Hours

Introduction to Excel: introduction, about worksheet, entering information, saving. Introduction of Operating System: introduction, operating system concepts, types of operating system. Computer Networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network.

### Transaction Mode

Video based teaching, collaborative teaching, case based teaching, Question-Answer

### Suggested Readings

- Leon & Leon, "Introduction to Computers", Vikas Publishing House, New Delhi
- Saxena S., "MS Office Xp for Everyone", Vikas Publishing House, New Delhi, 2007
- June Jamrich Parsons, "Computer Concepts", Thomson Learning, 7th Edition, Bombay
- White, "Data Communications & Computer Network", Thomson Learning, Bombay
- Comer, "Computer networks and Internet", Pearson Education, 4e
- Rajaraman, V., & Radhakrishnan, T. (2006).
- Digital Logic and Computer Organization. PHI Learning Pvt. Ltd.. Mehdi, M. M. (2015). Information Technology for Management by. FIIB Business Review, 4(1), 46-47.
- Ram, B. (2000).
- Computer fundamentals: architecture and organization. New Age International. Basandara, S. K. (2017). Computers Today,, Galgotia publication Pvt Ltd.
- A first course in computers: Based on Windows Xp & Office. Vikas Publishing House Pvt Ltd.
- Sinha P.K. and Sinha, P. (2007) Computer Fundamentals, BPB Publications.
- Bangia, R. (2008). Computer Fundamentals and Information Technology. Firewall Media.
- <https://www.researchgate.net>[https://www.youtube.com/playlist?list=PLWPirh4EWFpF\\_2T13UeEgZWZHc8nHBuXp](https://www.youtube.com/playlist?list=PLWPirh4EWFpF_2T13UeEgZWZHc8nHBuXp)

**Course Title: XXXX (MOOC)**

**Course Code: MHB399**

L	T	P	Cr.
4	0	0	4

**Total Hours: 60**

### Semester 4th

**Course Title: Training/Internship Report**

**Course Code: MHB401**

L	T	P	Cr.
0	0	0	20

**Course Learning Outcomes:** On successful completion of this course, the students will be able to

1. Prepare and maintain Operation Theatre as well as patients before surgery.
2. Maintain a sterile field and theatre equipment and follow infection control policies.
3. Manage hazardous waste and follow biomedical waste disposal protocols.
4. Demonstrate skills and knowledge to assist anesthetist in handling emergencies.

### Course Contents

Students have to carry out a research project (on any topic related to operation theatre technology) under the supervision of a faculty. The project report has to be prepared on the basis of the research work carried out. The assessment is done on the basis of the work done and the presentation and viva.