



MAHATMA GANDHI UNIVERSITY
of
MEDICAL SCIENCES & TECHNOLOGY
JAIPUR

Syllabus

**M.Sc. TRANSFUSION MEDICINE
TECHNOLOGY
(2 Years Degree Course)**

NOTICE

1. Amendments made by the Board of Management of the University in Rules / Regulations of Graduate Medical Courses shall automatically apply to the Rules/ Regulations of the Mahatma Gandhi University of Medical Sciences & Technology.
2. The University reserves the right to make changes in the syllabus/books/ guidelines, fee–structure or any other information at any time without prior notice. The decision of the University shall be binding on all.
3. The Jurisdiction of all court cases shall be Jaipur Bench of Hon'ble Rajasthan High Court only.

RULES & REGULATIONS
M.Sc. TRANSFUSION MEDICINE TECHNOLOGY (TMT)
(2 Years Degree Course)

DURATION OF COURSE:

The course shall be of 2 years duration from the date of commencement of academic session

MEDIUM OF INSTRUCTION

English shall be the medium of instruction.

ELIGIBILITY FOR ADMISSION:

For admission a candidate should have passed the B.Sc. Medical Laboratory Technology (MLT) or B.Sc. in Transfusion Medicine Technology course with minimum 50% marks in the aggregate.

SELECTION OF CANDIDATES:

Selection for M.Sc. TMT Course shall be done by an Admission Board strictly on merit judged on the basis of University Entrance Examination conducted in the month of July / August every year.

ATTENDANCE:

M.Sc. TMT Part I : 75% in theory and M.Sc. TMT Part II : 75% in Theory and Practical separately. Any candidate failing to achieve this, shall not be permitted to appear in the University examination.

ELIGIBILITY AND ENROLMENT:

Every candidate who is admitted to M.Sc. TMT Course in Mahatma Gandhi Medical College & Hospital shall be required to get himself/herself enrolled with the Mahatma Gandhi University of Medical Sciences & Technology after paying the prescribed enrolment/eligibility fees (upto November 30 of the year of admission without late fees and upto December 31 of the year of admission with late fees) along with the application form duly filled in and forwarded to the University through Principal of the College.

TRAINING:

1. The period of training for M.Sc.(TMT) course shall be of 2 years from the date of admission.
2. M.Sc. (TMT) Part – I and M.Sc. (TMT) Part – II shall be of 1 year each duration.
3. The students who have been registered late in the medical college will not be allowed to appear in the regular examination and they will be required to complete the period of study prescribed and fulfill the requirement of attendance.
4. The candidate will undertake the post graduate training as a full time post graduate in the department concerned. The candidate after passing M.Sc. (TMT) Part I examination shall also be required to participate in the undergraduate training in his/her subject. The head of the department shall certify that the students has been regular and undergone training programme according to the requirements.
5. M.Sc. (TMT) degree will be awarded for M.Sc . in Transfusion Medicine Technology.

EXAMINATION AND ASSESSMENT:

1. The examination in M.Sc. (TMT) Part I shall consists of three theory papers.
2. The examination in M.Sc (MLT) Part II shall consist of Two Theory papers and practical in the opted specialization.
3. A candidate shall be permitted a maximum of four attempts or 2 years to complete the part I examination from the year of admission.
4. Only those candidates will be allowed to appear at M.Sc. (TMT) Part II examination, who have passed M.Sc. (TMT) Part –I examination completely.

SCHEME OF EXAMINATION:

M.Sc. TMT Part I

1. **The Examination in Part I shall consist of:**

Code	Paper	Marks
	Theory	
	Paper I -	100 Marks
	Paper II -	100 Marks
	Paper III -	100 Marks
	Internal Assessment	100 Marks
	Practical & Viva Voce Examination	300 Marks
	Total Marks	700 Marks

Notes:

1. Each theory paper shall be of 3 hours duration.
2. Each paper will be set by the External Examiner of the subject concerned and will be assessed by the internal examiner of the subject concerned.

Pattern of questions to be set and answered shall be as follows:

Paper	No. of questions to be set	No. of questions to be answered
Paper I	4	4
Paper II	4	4
Paper III	4	4

3. In order to pass the University Examination, the candidate must secure a minimum of 50% marks in each theory paper.

4. A candidate who has failed in one or more theory paper of Part-I Examination must appear in that theory paper in supplementary examination which will be conducted by university within 4 – 6 months.

M.Sc. MLT Part II

The Examination in of Part II shall consist of:

Code	Paper	Marks
	Theory	
	Paper I -	100 Marks
	Paper II -	100 Marks
	Paper III -	100 Marks
	Internal Assessment	100 Marks
	Practical & Viva Voce Examination	300 Marks
	Dissertation	100 Marks
	Total Marks	800 Marks

Notes:

1. Each theory paper shall be of 3 hours duration.
2. All papers shall be set by the External Examiners.
3. Paper I will be assessed by the External Examiner and Paper II will be assessed by the Internal Examiner viz. Head of the Department of subject concerned. Paper III will be assessed by Professor / Associate professor / Assistant professor
4. Practical examination shall be conducted by one Internal, one External Examiner which will be appointed by the university.

Pattern of questions to be set and answered shall be as follows:

Paper	No. of questions to be set	No. of questions to be answered
Paper I	4	4
Paper II	4	4
Paper III	4	4

5. In order to pass the examination the candidate must secure a minimum of 50% marks in Theory papers including Viva and 50% marks in Practical separately.

6. In case a student passes either in Theory or in Practical only, the student shall be considered to fail in the whole examination and he will have to appear in both the Theory and Practical in the subsequent examination.
7. To successfully complete the course and pass the examination, a candidate shall be permitted a Maximum of four years from the date of his/her admission in the course, failing which he/she will have to leave the course.

PAPER SETTER/EXAMINER

1. All the examiners, paper setters, theory examination answer books evaluators, Internal and External Examiners for Practical examinations shall be appointed by the President of the University.
2. Qualification of the Paper setter / Examiner: Assistant Professor and above.
3. Paper setter can be an examiner

REVALUATION

No Revaluation shall be permitted in M.Sc. Examination. However, the student can apply for scrutiny of the answer books

GRACE MARKS

No grace marks will be provided in M.Sc. Examination.

M.Sc. TRANSFUSION MEDICINE TECHNOLOGY COURSE

M. Sc. (TMT)

FIRST YEAR

PAPER I – GENERAL PATHOLOGY , MICROBIOLOGY & BIOCHEMISTRY

- Collection of blood samples, types of anticoagulants
- Complete hemogram, Different methods of haemoglobin screening/estimation: Copper sulphate, haematology analysers, Sahli's, Cyanomethemoglobin and Hemocue methods, Red cell indices
- Anaemias – classification, causes and laboratory investigations for anaemias - Iron deficiency anemia, - Megaloblastic anemia, - Hemolytic anemia.
- Haemostasis and its investigations.
- Basic hematologic investigations and their normal values – Hb, TRBC, TLC, DLC, PCV, ESR, Platelet count, Reticulocyte count, Absolute values, PT,INR,APTT.
- Introduction to Microbiology, Fundamentals of microscopy, sterilization and disinfection
- Chemistry of Blood & Hemoglobin, Plasma proteins
- Bile salts ,bile pigments and iron metabolism
- Transfusion transmitted infections, HCV, HBV, malaria, syphilis
- CLIA, ELISA, rapid and other tests for diagnosis of transfusion transmitted infections
- Nucleic acid testing
- Bio safety , Management of Biomedical waste
- Instrumentation principles: PH meter, colorimeter, Spectrophotometer, Electrophoresis equipment

PAPER - II. HEMATOLOGY & GEN. IMMUNOLOGY

- Normal erythropoiesis, Leucopoiesis,
- Formation and function of platelets
- Classification of anaemia, their laboratory diagnosis,
- Hemoglobinopathy :Beta Thalassemia and Sickle cell disease, G6PD deficiency, Polycythemia
- Autoimmune hemolytic anaemia, classification, diagnosis, specificity of autoantibodies
- Coagulation Mechanism, Hemostasis, laboratory tests for coagulation, Platelet Disorders
- Haematological malignancies

- Bone marrow transplantation, peripheral stem cells, cord blood stem cells, cord blood banking
- Introduction to Immunology, History, Immunity
- **Antigens** : Immunogen, allo-antigen, soluble antigen, Red cell antigen, Epitopes
- **Antibodies**: Polyclonal antibodies, development of antibodies, structure of immunoglobulins, characteristics of immunoglobulins
- **Monoclonal antibodies**: Hybridoma technology, Human monoclonal antibodies, Applications of MAb

PAPER -III BLOOD DONATION & BLOOD COMPONENTS

- 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
- Blood collection room equipment, their principles, and use, emergency medicines, Pre donation counselling, Bleeding of the donor, post donation care, post donation counselling
- 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
- 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.

M.Sc. TRANSFUSION MEDICINE TECHNOLOGY COURSE

M. Sc. (TMT)

SECOND YEAR

PAPER – I TRANSFUSION THERAPY

- Management of Blood Bank Issue Counter, Criteria for acceptance of requisition form, inspection of blood component prior to issue.
- Blood administration, transfusion filters, post transfusion care, Therapeutic plasma exchange
- Judicious use of blood; management of different types of anemia, management of bleeding patient, Neonatal transfusion, Transfusion practices in surgery, Transfusion therapy for oncology and trans plantation patents.
- Hemolytic transfusion reaction immediate and delayed; immune and non immune reaction path physiology; Clinical signs and symptoms Laboratory invigilation for HTR Tests to defect bacterial Contamination in blood,
- Non- hemolytic transfusion reactions Immediate and delayed, febrile reaction, allergic reaction, clinical signs and symptoms.
- Acute transfusion related lung injury, alloimmunization, Iron overload, Graft versus host disease.
- Strategies to prevent transfusion reactions
- Inventory management and maintenance of blood stock.
- Irradiated blood components
- Blood substitutes
- Measurement of factor VIII level in FFP
- Measurement of fibrinogen level in FFP
- Sterility test on platelet concentrates.
- Sterility test on Whole blood
- Measurement of pH and other platelet parameters.

PAPER -II IMMUNOHAEMATOLOGY

1. Basic Principles of immunohaematology, Application of Blood groups: Population Genetics, Forensic medicine, Transfusion medicine
2. ABO Blood of Group Systems: History, Genetics, ABH antigens, Biochemical Synthesis of blood group antigens, Antigenic sites, weaker variants, Bombay Phenotype, ABO antibodies,
3. Rh Blood Group System: History, Genetics, Molecular Genetics, Nature of Rh Antigens, Partial D, Weak D, other variants of Rh, Rh Null, Rh antibodies, factors influencing Rh immunization, Functional role of Rh antigens
4. Other Blood Group Systems: Lewis, P, Ii, MNSs, Kell, Duffy, Celano, In, Private antigens, Public antigens.
5. Antenatal Serology, Hemolytic disease of the newborn due to ABO Incompatibility, Rh Incompatibility and other allo-antibodies
6. Red cell serology techniques, their advantages and disadvantages, Cell and serum grouping, detection of weak A and B antigens and weak D/Partial D cases, Trouble shooting in red cell serology
7. Pre transfusion testing, Different methods of cross matching, cross matching in special circumstances, emergency cross matching, electronic cross matching
8. Principles of Direct and indirect antiglobulin test, enzyme technique, albumins technique, Detection of blood group antibodies, identification of their Specificity, clinical significance of antibody detection, differentiation between auto and allo-antibodies
9. Gel Technology, Micro plate technique
10. Antigen antibody reaction: Antigen concentration, antibody concentration, enhancing media, other factors influencing antigen antibody reaction, Immunoassays: ELISA,
11. Cells of immune system: Phagocytic cells, Antigen presenting cells, T cells, T cell subsets, B cells, CD Markers, Flowcytometry for counting T & B cells
12. Autoimmune disorders
13. Complement System
14. HLA antigens, HLA antibodies, HLA Serology, Histocompatibility matching: Molecular methods
15. Molecular methods in Immunology

PAPER - III

QUALITY CONTROL DOCUMENTATION AND RECENT ADVANCES

1. Quality control of blood grouping reagents, QC of anti-human globulin reagent, bovine albumin, Normal saline
2. Quality control of blood bags
3. Quality control of different blood bank Components, sterility test on component.
4. Automation in blood banking
5. Calibration, validation and maintenance of blood bank equipment, QC of blood bank techniques, internal and external QC.
6. Organization of blood bank services, Blood Bank premises and infrastructure, Regional blood transfusion centre and blood storage centres, Blood bank management system
7. Regulations for blood bank operation: Drugs and cosmetics Law, National blood policy, standards in Blood Banking, licensing procedures.
8. Recruitment and training of blood bank personnel, Proficiency testing.
9. Blood Bank Accreditation.
10. Automation in Blood Banking
11. Nucleic Acid Testing
12. Apheresis
13. Stem Cells

PRACTICAL

FIRST YEAR:

1. Hemoglobin estimation
2. Total leukocytes count
3. Total RBC count
4. Platelet count
5. Staining of blood film & interpretation of PBF
6. Differential leukocytes count
7. Packed cell volume (PCV)
8. Erythrocyte sedimentation rate (ESR)
9. Reticulocyte count
10. Sickling test
11. Osmotic fragility test
12. Prothrombin time (PT)
13. ABO & Rh blood grouping

SECOND YEAR:

1. Antibody screening
2. Antibody identification
3. Compatibility testing
4. DCT & ICT
5. Adverse transfusion reaction workup
6. Quality control
7. Apheresis procedures
8. Antibody titration
9. Antibody staining
10. PCR testing
11. Component preparation
12. CLIA/ELISA test
13. Automation in Blood banking

DISSERTATION / PROJECT WORK

The Dissertation / Project work shall be conducted under the supervision of an allotted guide of the opted subject. The work shall relate to the transfusion services, lab investigations and quality management in reference to Transfusion Medicine.

The candidate shall submit the Dissertation / Project work as a printed copy to the Head of Department at least one month before commencement of University Theory paper examination otherwise permission to appear in the University examination shall not be granted. The same shall be presented and assessed at the time of Examination.

MODEL PAPER

**M.Sc. Part – I
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TMT_PI_I

M.Sc. TRANSFUSION MEDICINE TECHNOLOGY

Part – I (Main) Examination month year

Paper – I

Gen. Pathology, Biochemistry & Microbiology

Time: Three Hours

Maximum Marks: 100

Attempt all Questions.

All the parts of one question should be answered at one place in sequential order.

Illustrate your answers with suitable diagrams, wherever necessary.

- Q. 1 Define and classify anemia. Describe in brief the laboratory investigations required for iron deficiency anemia. 25
- Q. 2 Enumerate Transfusion Transmitted Infection. Describe the principal of CLIA for detection of TTI and its limitations. 25
- Q. 3 Write in brief –
- a) Anticoagulants used in hematology 12½
 - b) Segregation of biomedical waste by color coding according to BMW rule – 2016 12½
- Q. 4 Write short notes on (any five) 25
- a) Prothrombin time (PT)
 - b) Plasma Proteins
 - c) Forward blood grouping
 - d) Biosafety Cabinet
 - e) ABO System
 - f) Autoclave
 - g) Erythrocyte sedimentation rate (ESR)

MODEL PAPER

M.Sc. Part – I
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TMT_PI_II

M.Sc. TRANSFUSION MEDICINE TECHNOLOGY

Part – I (Main) Examination month year

Paper – II

HEMATOLOGY & GEN.IMMUNOLOGY

Time: Three Hours

Maximum Marks: 100

Attempt all Questions.

All the parts of one question should be answered at one place in sequential order.

Illustrate your answers with suitable diagrams, wherever necessary.

- Q. 1. Classify autoimmune hemolytic anemia. Describe in brief the laboratory investigations required for diagnosis of AIHA. 25
- Q. 2. Discuss the Coagulation system. Write the important factors responsible for intrinsic pathway 25
- Q. 3. Write in brief –
- a) Discuss ABH antigens-antibodies in disease, ABO discrepancies and their resolution 12¹/₂
 - b) What are the major factors affecting antigen antibody reaction. Discuss any one in brief. 12¹/₂
- Q. 4. Write short notes on. (Any five) 25
- a) Thrombocytopenia
 - b) Beta thalassemia trait
 - c) Direct Coombs Test
 - d) Zeta Potential
 - e) Techniques of Blood grouping
 - f) Prozone phenomenon
 - g) Polyagglutination.

MODEL PAPER

M.Sc. Part – I
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TMT_PI_III

M.Sc. TRANSFUSION MEDICINE TECHNOLOGY

Part – I (Main) Examination month year

Paper – III

BLOOD DONATION & BLOOD COMPONENT

Time: Three Hours

Maximum Marks: 100

Attempt all Questions.

All the parts of one question should be answered at one place in sequential order.

Illustrate your answers with suitable diagrams, wherever necessary.

- Q.1. Enumerate the name of blood components. Discuss technical procedure for component preparation . 25
- Q.2. Discuss inventory management and stock preparation in the blood bank. 25
- Q.3. Write in brief –
- a) Discuss awareness program for voluntary blood donation 12¹/₂
 - b) Discuss preparation of Leucodepleted components 12¹/₂
- Q.4. Short notes (Any 5 out of 7) 5x5=25
- a) Swirling test
 - b) Cryoprecipitate
 - c) Adverse transfusion reaction
 - d) Platelet agitator
 - e) Storage lesion in blood components
 - f) QC of Fresh frozen plasma
 - g) Therapeutic Phlebotomy

MODEL PAPER

M.Sc. Part – II

TMT_PII_I

M.Sc. TRANSFUSION MEDICINE TECHNOLOGY

Part – II (Main) Examination month year

Paper – I

TRANSFUSION THERAPY

Time: Three Hours

Maximum Marks: 80

Attempt all Questions.

All the parts of one question should be answered at one place in sequential order.

Illustrate your answers with suitable diagrams, wherever necessary.

- | | | |
|------|---|----|
| Q. 1 | Discuss the various methods used in Compatibility testing ? | 20 |
| Q. 2 | Define ABO system and its genetics. | 20 |
| Q. 3 | Write in brief – | |
| | a) Investigation of incompatible blood transfusion | 10 |
| | b) Prerequisite criteria for issuance of blood | 10 |
| Q. 4 | Write short notes on (any four) | 20 |
| | a) Type of blood group discrepancy | |
| | b) Storage temperature of blood components. | |
| | c) Rh immunoglobulin | |
| | d) Massive transfusion | |
| | e) Zeta potential | |
| | f) Criteria for platelet pheresis donation | |

MODEL PAPER

M.Sc. Part – II
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TMT_PII_II

M.Sc. TRANSFUSION MEDICINE TECHNOLOGY

Part – II (Main) Examination month year

Paper – II

IMMUNOHEMATOLOGY

Time: Three Hours

Maximum Marks: 80

Attempt all Questions.

All the parts of one question should be answered at one place in sequential order.

Illustrate your answers with suitable diagrams, wherever necessary.

- Q. 1 Discuss the indications, principle , procedure, controls and utility of Antihuman Globulin test 20
- Q. 2 Discuss various techniques of Antibody screening and importance in multi transfused recipient 20
- Q. 3 Write in brief –
- a) Hemolytic disease of newborn 10
 - b) Pre transfusion compatibility testing 10
- Q. 4 Write short notes on (any four) 20
- a) Bombay blood group
 - b) Alloantibody
 - c) Reverse blood grouping
 - d) Elution technique
 - e) Column Agglutination Technique
 - f) Solid Phase technology in Immunohematology

MODEL PAPER

M.Sc. Part – II
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TMT_PII_III

M.Sc. TRANSFUSION MEDICINE TECHNOLOGY

Part–II (Main) Examination month year

Paper – III

QUALITY CONTROL & RECENT ADVANCES IN BLOOD BANKING TECHNIQUE

Time: Three Hours
Maximum Marks: 80

Attempt all Questions.

All the parts of one question should be answered at one place in sequential order.
Illustrate your answers with suitable diagrams, wherever necessary.

- Q. 1. Discuss and describe the technological advances and future trends in blood banking. 20
- Q. 2. Discuss about the various emerging infections threatening the safety of blood supply in India. 20
- Q. 3. Write in brief –
- a) Discuss the validation process in the blood bank. 10
 - b) Pathogen inactivation of cellular blood products. 10
- Q. 4. Write short notes on. (any four) 20
- a) Haemovigilance
 - b) Cellular therapy
 - c) Transcription mediated amplification technology
 - d) Software system in blood bank
 - e) Use of bar codes
 - f) Immunotherapy