It is hereby notified for the information of all concerned that the Vice-Chancellor, in anticipation of the approval of the competent authority, is pleased to authorize adoption of the Syllabi & Courses of Study for MD Immunohematology & Blood Transfusion (given in annexure) for the examinations to be held in the years 2010, 2011 and 2012.

Sd/-
REGISTRAR

No. F.Acd/II/116/10/3641-51
Dated: 06-07-2016
I  HISTORY OF TRANSFUSION MEDICINE

1.1 Scientific landmarks in its development
1.2 Impact of world wars on its development
1.3 Development of PVC bags

II  SCIENTIFIC BASIS OF TRANSFUSION

A  Biochemistry & physiology of elements of blood

2.0 Process of cell production and life span
   2.1 Red cells
   2.2 White blood cells
   2.3 Platelets

3.0 Red cells
   3.1 Hemoglobin structure & function
   3.2 Metabolic pathways
   3.3 Membrane structure & function

4.0 White cells
   4.1 Structure, function & kinetics

5.0 Platelets
   5.1 Structure, function & kinetics

6.0 Physiology of Hemostasis
   6.1 Role of platelets
   6.2 Coagulation pathways
   6.3 Fibrinolysis

7.0 Hemodynamics of blood flow & volume

8.0 Iron metabolism

9.0 Bilirubin metabolism
B Immunology

10.0 Principles of basic immunology
   10.1 Antigen, Antibody, Complement, Immunoglobulin
   10.2 Antigen / antibody reaction
   10.3 Lymphocytes in humoral & cellular immunity

11.0 Role of Hybridoma technology in immunohematology

12.0 Immunology of transplantation

13.0 HLA & genetic control of immune response

C Genetics

14.0 Principles of basic genetics

15.0 Genetics of blood groups
   15.1 Phenotypes & genotypes
   15.2 Principles of blood group inheritance
   15.3 Population genetics of blood groups

III ANTIGEN SYSTEMS IN FORMED ELEMENTS OF BLOOD

16.0 Red cell antigens

17.0 Leucocyte antigens

18.0 Platelet antigens

IV BLOOD COLLECTION, PROCESSING, COMPONENT PREPARATION

A Management of blood donation

19.0 Donor recruitment
   19.1 Voluntary blood donation system
   19.2 Categories of blood donors
   19.3 Education & awareness of prospective donor

20.0 Acceptability criteria of blood donor
21.0 Care of blood donors

21.1 Pre-donation
21.2 Mid-donation
21.3 Post-donation
21.4 Prevention & management of complications of blood donation

22.0 Blood collection

22.1 Anticoagulants & preservatives
22.2 Procedure
22.3 Blood donation camps

B Blood components

23.0 Components

23.1 Types
23.2 Methods of preparation
23.3 Indications, dosage & administration
23.4 Leuco-depletion
   23.4.1 various methods
   23.4.2 quality control

24.0 Storage of blood & components

24.1 Whole blood
24.2 Red cell concentrate
24.3 Plasma
24.4 Granulocyte
24.5 Cryoprecipitate
24.6 Stem cells
   24.6.1 peripheral blood stem cell
   24.6.2 cord blood

25.0 Plasma fractionation

V PRE-TRANSFUSION TESTING

26.0 Compatibility testing

26.1 ABO grouping & Rh typing
26.2 Antibody screening
26.3 Methods of cross matching
26.4 Newer methods of cross matching
   26.4.1 solid phase
   26.4.2 gel technology
27.0 Screening for transfusion transmitted infections

27.1 Methodology
27.2 Nucleic acid amplification techniques
27.3 Newer emerging pathogens
   27.3.1 Prions
   27.3.2 C J disease
   27.3.3 Lyme disease
   27.3.4 others

28.0 Selection of blood, components & plasma products for transfusion

ADVERSE EFFECTS OF BLOOD TRANSFUSION

29.0 Clinical presentation, pathophysiology, investigations, management

   29.1 Hemolytic transfusion reaction
   29.2 Non hemolytic transfusion reaction

30.0 Transfusion transmitted infections

31.0 Transfusion associated graft versus host disease

32.0 Transfusion related acute lung injury

33.0 Others

   33.1 Hemosiderosis
   33.2 Volume overload

II APHERESIS

34.0 Technology of apheresis and various machines

35.0 Hemapheresis (platelets, granulocytes, plasma)

   35.1 Donor selection
   35.2 Procedure
   35.3 Complications

36.0 Therapeutic apheresis

   36.1 Indications, procedure & complications
   36.2 Plasma exchange, red cell exchange
   36.3 Newer methods for immunoadsorption
AUTOLOGOUS TRANSFUSION

37.0 Basic principles, indications, contra-indications
   37.1 Pre-deposit
   37.2 Hemodilution
   37.3 Intra-operative blood salvage including equipment
   37.4 Directed donation

ANTENATAL & NEONATAL TRANSFUSION PRACTICE

38.0 Pathophysiology, diagnosis & management
   38.1 Rh incompatibility
   38.2 ABO & other blood group incompatibility

39.0 Exchange transfusion
   39.1 Indications, methodology & complications

40.0 Neonatal transfusion practice

IMMUNOHEMATOLOGY

41.0 Classification, diagnosis and management
   41.1 Immune hemolytic anemia
   41.2 Immune thrombocytopenia
   41.3 Immune neutropenia

42.0 Immunohematological problems in multi-transfused patients

HEMOTHERAPY

43.0 Pathophysiology, diagnosis and management of anemia
   43.1 Anemia
      43.1.1 Iron deficiency anemia
      43.1.2 Megaloblastic anemia
      43.1.3 Aplastic anemia
      43.1.4 Anemia of uremia
   43.2 Hemoglobinopathies
      43.2.1 Thalassemia
      43.2.2 Sickle cell anemia
44.0 Pathophysiology, diagnosis and management of hemostatic disorders

44.1 Hemophilia
44.2 Von willebrands disease
44.3 Platelet disorders
   44.3.1 Qualitative disorders
   44.3.2 Quantitative disorders
44.4 DIC

45.0 Pathophysiology, diagnosis and transfusion support in acute blood loss

45.1 Shock
45.2 Massive transfusion

46.0 Transfusion support in cardiac surgery

47.0 Classification & transfusion support in Oncology

47.1 Leukemia
47.2 Lymphoma
47.3 Marrow failure

XII TRANSPLANTATION

48.0 Transfusion support in transplantation

48.1 Peripheral blood stem cell transplantation
   48.1.1 Harvesting
   48.1.2 Cryopreservation
   48.1.3 CD34 counting

48.2 Bone marrow transplantation
   48.2.1 Harvesting
   48.2.2 Processing
   48.2.3 Immunohematological problems in ABO mismatched BMT

48.3 Transfusion support specialized conditions
   48.3.1 Renal transplantation
   48.3.2 Liver transplantation
   48.3.3 Others

49.0 Irradiation of blood products

49.1 Indications, dosage, adverse effects

50.0 Tissue banking
I BLOOD SUBSTITUTES & HEMOPOIETIC AGENTS
51.0 Crystalloid & colloids
52.0 Oxygen carrying compounds
53.0 Hemopoietic growth factors
54.0 Albumin

XIV MEDICOLEGAL CONSIDERATIONS IN TRANSFUSION MEDICINE
55.0 Ethical & legal considerations pertaining to transfusion practice
56.0 Identification of blood stains
57.0 Paternity testing
58.0 Donor notification and counseling
59.0 Look back program
60.0 Drugs & Cosmetics act, Accreditation

XV TOTAL QUALITY MANAGEMENT
61.0 Development of standard operating procedures (SOP) manual
62.0 Quality control
   62.1 Reagents
   62.2 Instruments
   62.3 Personnel
   62.4 Blood & components
63.0 Quality assurance
   63.1 Internal quality control
   63.2 External quality assurance
64.0 Hospital transfusion committee
65.0 Medical audit
XVI ORGANISATION & MANAGEMENT OF TRANSFUSION SERVICES

69.0 Organisation & function of blood services & hospital transfusion practice
   69.1 Donor recruitment & motivation
   69.2 Operation of blood mobile
   69.3 Development of transfusion service
   69.4 Inventory control
   69.5 Development of forms, labels, records etc

XVII BLOOD SAFETY

70.0 Sterilization

71.0 Disposal of bio-hazardous material

XVIII MODERN BIOLOGICAL TECHNIQUES

72.0 Principles, methods, relevance in transfusion medicine
   72.1 Western blot
   72.2 Polymerase chain reaction
      72.2.1 SSCP
      72.2.2 SSOP
   72.3 Dot blot hybridization

XIX AUTOMATION & COMPUTERIZATION

73.0 Automated blood grouping & processing

74.0 Instrumentation & use of bar codes

75.0 Use of computers in blood banking

In addition to the prescribed curriculum, the candidates will be required to take basic courses in Biostatistics, Computers, Medical ethics etc organised by the Institute from time to time.
The candidates will be rotated through various sections of the department as under.

A) Blood donor management 6 months
   - Donor recruitment & motivation
   - Blood donor selection
   - Phlebotomy
   - Post donation care of donor
   - Apheresis
     - Donor apheresis
     - Therapeutic plasma exchange
   - Outdoor blood donation camps

B) Component preparation & Quality Control 5 months
   - Preparation of various blood components
     - PRBC, FFP, PC, Cryo, Leuco-poor
   - Irradiation of blood components
   - Storage & quality control

C) Transfusion transmitted infection screening 5 months
   - Screening for various markers
     - HIV, HCV, HbsAg, Syphilis
   - Methodology:
     - ELISA, Spot, Rapid, Automated analyser
     - Molecular techniques

D) Immunohematology 6 months
   - Diagnosis & Transfusion support in
     - AIHA
     - PNH
     - Transfusion reaction
     - Antenatal serology
     - Multi-transfused patients
   - Secretor status
   - Minor red cell antigen typing

E) Pre transfusion testing & Cross matching 6 months
   - ABO grouping & Rh typing
   - Du testing, genotyping
   - Irregular antibody screening & identification
   - Cross-matching

F) Quality control / computers / records 2 months

Total 30 months
Training in allied departments

A) Dept of Pathology (Hematology division) 1 month
   Complete Hemogram
   Reading of peripheral smear
   Coagulation work up

B) Dept of Genetics 1 month
   HLA typing
   Transfusion in thalassemia

C) Dept of Immunology 1 month
   Isolation of Lymphocytes
   Immunophenotyping
   CD 4 / CD 8 counts
   Immunofluorescence
   PBSCT
   Harvest
   CD 34 counts
   Cryopreservation

D) Dept of Microbiology 1 month
   Bacterial culture
   Grams staining
   Special molecular techniques

E) Dept of Anesthesiology 1 month
   Intra-operative hemodilution
   Operation of cell saver
   Intra-operative transfusion

F) National Plasma Fractionation Center, Mumbai 1 month
   Fractionation
   Advanced serology

G) Dept of Clinical Hematology & BMT 2 weeks

Total 6 month
PRACTICAL EXAMINATION PATTERN FOR APPROVAL:

1ST DAY

1. Long Immunohematology exercise: (one) Shall include followings
   Antenatal serology, Alloantibody & Autoantibody detection, identification,
   Transfusion reaction work-up, Massive transfusion and their management.
   This will be followed by viva-voce

2. Short exercises (Two) Shall consist of the followings
   a) Operation of BTS (Donor management, inventory, apheresis)
   b) Short exercise (Reagents, Blood group discrepancy, component preparation,
      quality control, Transfusion transmitted infections screening,)
   Both exercises will be followed by viva-voce

3. Clinical discussion (Two) : Hemotherapy exercises

2ND DAY

1. Short exercises (total 2) It shall consist
   a) Basic hematology - Hb, HCT, PLT count, PS reading, WBC Count etc
   b) Coagulation work up - BT/CT, PT/APTT etc
   Both exercises will be followed by viva-voce.

2. SPOTS

3. Grand viva + thesis discussion

INTERNAL ASSESSMENT OF THE CANDIDATE

The Board of studies in its meeting held on 17th may 2000 recommended that there
should be periodic internal assessment of the candidate by the department. The pattern if
the assessment & its format will be according to the institution norms in this regard.
BOOKS

1. Blood transfusion in clinical medicine.

2. Transfusion Medicine

3. Clinical Practice of Transfusion Medicine

   Ed. JAF Napier, John Willey & Sons, Chichester, 1987

5. Principles of transfusion medicine
   Ed. EC Rossi, TL Simon, GS Moss, William & Wilkins, Tokyo, 1991


7. Transfusion immunology & medicine
   Ed. Carel J van Oss, Marcel Dekker, New York, 1990

8. Blood separation & plasma fractionation
   Ed. J Robinson, Harris, Willey Liss, New York, 1990

9. Blood groups in man
   Ed. RR Race, R Singer, Blackwell Scientific Pub, Oxford, 8th edition

10. Applied blood group serology

11. Practical blood transfusion
    Ed. DW Huestis, JR Bove, J Case, Little Brown & Com, Boston 1987

12. Progress in transfusion medicine
    Ed. JD Case, Vil I, II, III, Churchill Livingstone, London


14. Transfusion medicine : Recent technological advances
    Ed K Murawski, F Poetooni, Blackwell Sci Pub, Oxford
15. Clinical Blood Transfusion


17. Blood transfusion: A conceptual approach
   Ed. JG Kelton, N Heddle, M Blajchman, Churchill Livingstone, 1984

18. The human blood groups.
   Ed PH Anderson, CC Thomas, Springfield, USA

19. Plasma fractionation & blood transfusion
   Ed CTS Sibinga, PC Das, S Seidl, Martinus Nijhoff Pub, Boston 1985

20. Transplantation & blood transfusion
   Ed CTS Sibinga, PC Das, G Opel, Martinus Nijhoff Pub, Boston, 1985

21. Future developments in blood banking
   Ed. CTS Sibinga, PC Das, TJ Greenwalt, Martinus Nijhoff Pub; Boston 1984

22. Quality assurance in blood banking & its impact
   Ed. CTS Sibinga, PC Das, HF Tassel, Martinus Nijhoff Pub Boston 1984

23. Microbiology in blood transfusion
   Ed JJ Barbara, PSG Wright, Bristol 1983

24. The human blood groups
   Ed. C Salmon, Year Book Medical Pub, New York, 1984

25. The text book of blood sciences
   Ed. CM Zmijewaski, WE Haesler, Appleton Century Crofts, New York 1982

26. Transfusion therapy: Principles & procedures
   Ed. RC Rutman, WV Miller, Aspen Publication Rockville, 1985

27. Fundamentals og immunohematology: Theory & techniques
   Ed. ML Turgeon, Lea & Febiger, PA 1989

28. Transfusion transmitted infections
   Ed. DM Smith, RY Dodd,

29. Blood loss replacement
   Ed M Marshall, T Bird
31. Bone marrow & stem cell processing: A manual of current techniques
   Ed. EM Areman, HJ Deeg, RA Sacher, FA Davis PA, 1994

32. Scientific basis of transfusion medicine: Implications for clinical practice
   Ed Anderson, PM Ness, Saunders, 1994

BOOKS FROM AMERICAN ASSOCIATION OF BLOOD BANKS (AABE)

1. Technical manual, ed FK Widman
2. Donor room procedures, ed TS Green, D Steckler
3. Blood transfusion therapy: A Physicians handbook, ed EL Snyder, MS Kennedy
4. Accreditation requirement manual, ed RE Klein
5. Standards for blood banks & transfusion service, ed PV Hollan, PJ Schmidt
6. Therapeutic apheresis, ed J Kolins, JM Jones
7. Legal issues in transfusion medicine, ed GM Clark
8. New frontiers in blood banking, ed CH Wallás, LJ McCarthy
10. Autologous transfusion & hemotherapy, ed HF Tasswell, AA Pineda
11. Platelets, ed DM Smith, SH Summers
12. Blood groups system: Rh, ed W Tyler, SR Pierce
15. Computers in blood banks, ed LK Wilson, DM Eliot
16. Competition in blood services, ed GM Clark
17. Educational programmes in transfusion medicine, ed CH Wallas, TL Simon
18. Plasmapheresis, ed Y Nose, J Smith, RS Krakeur
**LIST OF JOURNALS**

1. Lancet
2. Nature
3. British Medical Journal
4. British journal of hematology
5. Blood
6. Journal of clinical pathology
7. American journal of clinical pathology
8. Annals of hematology
9. American journal of hematology
10. Vox sanguinis
11. Transfusion
12. Transfusion medicine review
13. Transfusion medicine & Apheresis
14. Transfusion science
15. Journal of clinical apheresis
16. Thrombosis & hemostasis
17. Seminars in hematology
18. Seminars in thrombosis & hemostasis
19. European journal of hematology