SARDAR PATEL UNIVERSITY

Rules & Regulations for the Degree of

M.Sc. - Medical Technology in Perfusion Technology

(Effective from June 2012)

R. M.Sc. PFT. 1: Eligibility for the admission:

A candidate for the admission to M.Sc.-Medical Technology (in Perfusion Technology) must have passed the B.Sc. degree Examination of the Sardar Patel University with Medical Laboratory Technology (any speciality) / Physics / Chemistry / Microbiology / Bio Chemistry / Zoology / Botany / Bio Technology / Genetics as principal subject OR B.Sc.(Nursing) OR an examination in any other university with 10+2+3/4 system recognized as equivalent to any of the above courses.

R. M.Sc. PFT. 2: Duration of the course:

The degree of Master of Science, a fulltime two-year course, would be through papers, practicals and dissertation work, wherever prescribed.

R. M.Sc. PFT. 3 Medium of instruction:

The medium of instruction and examination shall be in English.

R. M.Sc. MLT. 4: Attendance

Candidate shall be required to attend at least 75% of the Lectures and Practicals separately in each year.

R. M.Sc. PFT. 4 Subjects, Credits and Scheme of examination:

The final examination would be conducted at the end of each academic year as shown in the following Table 1 & Table 2.

Table 1: Paper-wise credits and teaching hours

Course code	Name of Paper	Credits per week	Teaching hours
M.Sc Part I (at the end of first year)			
MPFT - 101	Perfusion Technology-Foundation	3	90
MPFT – 102	Introduction to Perfusion Technology	3	90
MPFT- 103 (P)	Perfusion Technology-Practicals	2	90
	Theory/Practical hours		270
	Clinical/OT posting		600
	Total Teaching hours		**870**
M.Sc Part II (at the end of second year)			
MPFT-201	Perfusion Technology – Clinical	2	60
MPFT-202	Perfusion Technology – Applied	2	60
MPFT-203	Perfusion Technology – Advanced	2	60
MPFT-204 (P)	Perfusion Technology-Practicals	2	90
	Theory/Practical hours		270
	Clinical/OT posting		600
	Total Teaching hours		**870**

Table 2: Examination System and Mark distribution: Theory and Practical

Course code	Name of Paper	Marks		Total	Exam Duration
		Internal	External		
M.Sc Part I (at the end of first year)					
MPFT - 101	Perfusion Technology- Foundation	20	80	100	3 hours
MPFT – 102	Introduction to Perfusion Technology	20	80	100	3 hours
MPFT-103 (P)	Perfusion Technology-Practical/Oral	30	120	150	1 day
	Total	70	280	350	
M.Sc Part II (at the end of second year)					
MPFT-201	Perfusion Technology – Clinical	20	80	100	3 hours
MPFT-202	Perfusion Technology – Applied	20	80	100	3 hours
MPFT-203	Perfusion Technology – Advanced	20	80	100	3 hours
MPFT-204 (P)	Perfusion Technology-Practical/Oral	40	160	200	1 day
---	Dissertation Viva	---	---	50	During Practical exam
	Total	100	400	550	
	Grand Total (M.Sc. Part I & II)	170	680	900	

R. M.Sc. MLT. 5: Every candidate shall maintain a regular record of his practical work / Journal, which will be checked by the teacher from time to time and duly certified by the head of department at the end of the course.

R. M.Sc. MLT. 6: **(a)** Every candidate shall carry out a dissertation work on the topic assigned to him/her by the head of the department under the guidance of a recognized Post Graduate teacher of the concerned specialty.

(b) A candidate shall be considered eligible for the final Examination only if s/he submits the dissertation thesis **at least three months** before the final examination, to the concerned Department. A dissertation Viva of 50 marks would be conducted at the final practical examination.

R. M.Sc. MLT. 7: A candidate shall be deputed for a total of a minimum 3 weeks (to maximum 5 weeks) during the entire course, either at a stretch or in parts, to one or more such reputed Institute, where they can get exposure of advanced techniques. This includes days of his attending at least one state level and one national conference of related specialty. The concerned department/Institute does not have any financial obligation, as such, for the deputation of candidate. All expenses will be borne by the candidate.

R. M.Sc. MLT. 8: A candidate desirous for appearing in the University examination of any/all theory papers and/or practical must forward his/her application in the prescribed form from the respective college to the University on or before the date prescribed for the purpose under the relevant ordinance.

R. M.Sc. MLT. 9: **Standard of passing:**

The standard of passing the M.Sc. degree examination will be as under:

(a) To pass the M.Sc. Degree examination, a candidate must obtain at least **45% marks** (aggregate of external and internal) in each of the FIVE theory papers of Part I and part II as well as in practical **separately.**

(b) Award of class will be as per the other degree examinations of faculty of Medicine, S.P. University.

R. M.Sc. MLT. 10: A.T.K.T.

(a) A candidate, who fails in **any one or more** of the theory papers or in practical examination in M.Sc. Part I, will be allowed to continue M.Sc, Part II and appear **in those paper/s or practical**, as the case may be, during the subsequent University examination.(part/whole repeat examination)

(b) A candidate who fails in one or more of the Part I theory papers, will be allowed to appear in those paper/s during the subsequent University examination along with his/her Part II examination.

(c) It is necessary for the student appearing for repeat exam to appear again for the preliminary exam conducted for that particular theory paper or practical. His/her internal marks would be calculated only on the basis of last preliminary exam.

SARDAR PATEL UNIVERSITY

M.Sc.- Medical Technology in Perfusion Technology

Proposed Curriculum

M.Sc Part I

PAPER I : Perfusion Technology- Foundation

(A) ANATOMY

Introduction: human body as a whole

- Definition of anatomy and its divisions
- Terms of location, positions and planes
- Cell and its organelles
- Epithelium-definition, classification, describe with examples, function
- Glands- classification, describe serous & mucous glands with examples
- Basic tissues – classification with examples

Cardiovascular system

- Heart-size, location, chambers, exterior & interior
- Blood supply of heart
- Systemic & pulmonary circulation
- Branches of aorta, common carotid artery, subclavian artery, axillary artery, brachial artery, superficial palmar arch, femoral artery, internal iliac artery
- Peripheral pulse

- Inferior venacava, portal vein, portosystemic anastomosis
- Great saphenous vein
- Dural venous sinuses
- Lymphatic system- cisterna chyli & thoracic duct
- Histology of lymphatic tissues
- Names of regional lymphatics, axillary and inguinal lymph nodes in brief

Demonstration:

a) Demonstration of heart and vessels in the body
b) Histology of large artery, medium sized artery & vein, large vein
c) Microscopic appearance of large artery, medium sized artery & vein, large vein
d) pericardium
e) Histology of lymph node, spleen, tonsil & thymus
f) Normal chest radiograph showing heart shadows
g) Normal angiograms

Respiratory system

Theory:

- Parts of RS, nose, nasal cavity, larynx, trachea, lungs, bronchopulmonary segments
- Histology of trachea, lung and pleura
- Names of paranasal air sinuses

Practical:

2. Demonstration of parts of respiratory system.
3. Normal radiographs of chest
4. Histology of lung and trachea

(B) HUMAN PHYSIOLOGY

Theory:

Blood and Muscle Physiology:

- Compositin & Fucnction of Blood
- Erythropoesis and Leucopoesis
- Hemostasis
- Action potential and mechanism of Muscle contraction
- Neuromuscular junction

Cardiovascular and Respiratory Sustem

- Heart rate and sound
- Blood pressure
- Cardiac cycle and output
- Mechanism of breathing
- Oxygen and Carbon dioxide Transport
- Pulmonary volume and capacity

(C) MICROBIOLOGY

Theory

Morphology

- Classification of microorgaisms,
- Size, shape and structure of bacteria.

Sterilisation and Disinfection

3. Principles and use of equipments of sterlization namely Hot Air oven, Autoclave and serum inspissrator. Pasteurization,
4. Anti septic and disinfectants

Hospital infection

1.Causative agents, transmission methods,
2.Prevention and control Hospital infection.

Principles and practice Biomedical waste management

(4) MEDICINE: (And associated pathological, Biochemical and pharmacological aspects in brief)

Cardiovascular System

(d) Ischaemic heart diseases
(e) Rheumatic heart disease
(f) Congenital heart disease
(g) Hypertension
(h) Aortic Aneurysms
(i) Cardiomyopathy

Hematology

3.Anaemia
4.Bleeding disorders
5.Laboratory tests used to diagnose bleeding disorders (in brief)

Respiratory System

- Chronic obstructive airway diseases (COPD)
- Concept of obstructive versus restrictive pulmonary disease
- PFT and its interpretation

Renal System

- ARF & CRF
- End stage renal disease
- Role of dialysis and renal transplantation in its management

CNS

- Automatic nervous system
- (Sympathetic & Parasympathetic system)
- Brief mention of CNS disorders & their etiology

Others

- DM
- Obesity
- Pregnancy
- Paediatric Patient (neonate/Infant)
- Elderly patient

Paper II : INTRODUCTION TO PERFUSION TECHNOLOGY

Basics of diagnostic techniques:

- Chest of X-ray
- ECG
- Echo
- Angiography
- Nuclear Cardiology
- Laboratory investigations in relation to perfusion technology
- Cardiopulmonary bypass and perfusion technology
- History of Cardiac surgery and perfusion
- Specific reference of Gibbon Lillehei, carrel
- Pre CPB surgery
- Azygous Flow principle.
- Hypothermic/nonhypothermic non-CPB surgery including gross's
- Well technique and controlled cross circulation.

Monitoring and instrumentation

- Concepts of monitoring – instrumentation technology of ECG machine, pressure transducer, syringe and peristaltic pumps, monitors, ventilators, pulse oximeters, temperature probes and thermo regulatory monitoring, defibrillators and fibrillators. Piped and non-piped gas delivery systems and connections. Basic physics related to medically used gases.
- Haemodynamic monitoring
- Haemostatic monitoring
- Haemotologic monitoring
- Maintenance of oxygen, carbon dioxide and acid-base status and their monitoring
- Neurological monitoring (SSPE, EEG and cerebral function monitor)
- Aseptic technique.
- Cardiac surgery team, profession and terminology, scope of perfusion technology

Physiology of Extracorporeal circulation

Heart – Lung machine

- Principles of extracorporeal circulation
- Materials used in EC circuit
- Principles of extracorporeal gas exchange

Various types of oxygenators

- Bubble oxygenators
- Rotating spiral/cylinder/disc oxygenators

(c) Membrane oxygenators

(d) Mechanism of action components defoaming, rated flow.

Theory of blood pumps

- Ideal blood pump, pulsatile versus non-pulsatile flow, occlusive and non-occlusive pumps, various types of pumps roller, bellow, sigmamotor, diaphragm, ventricular and

centrifugal pumps.

Element of extracorporeal circulation/hazards of:

h) blood failure
i) Bubble trap
j) Flow meters
k) Temperatures
l) Heat exchanger
m) Regulating devices

Connection of the vascular system with extracorporeal circulation:

- Arterial and venous cannulae.
- Connecting tubes and connectors
- Vents
- Suckers
- Cardioplegia delivery system
- Venous drainage.
- Haemodynamic of arterial return, venous drainage, cardioplegia
- Delivery and venting.
- Blood banking, handling of blood products and their management. Blood components and their use.

M.Sc.(MT) Part II

Paper III : Perfusion Technology – Clinical

1. Pharmacokinetics and Pharmacodynamics of Cardiopulmonary bypass

2. Drugs (including anesthetic drugs) used in cardiopulmonary bypass

3. Conduct and monitoring of Cardiopulmonary bypass

4. Adequacy of perfusion – General considerations, specific aspects of perfusion, monitoring, other concomitants which may affect its adequacy

5. Pulsatile perfusion – Introduction, theory & physiology of pulsatile flow, hemodynamic, metabolic effects, Clinical use, hematological effects

6. Cannulation techniques during cardaiopulmonary bypass

7. Termination of cardiopulmonary bypass – principles and methodology

8. Myocardial protection and cardioplegia- pretreatment of the Myocardium, cardioplegia, hypothermia, controlled reperfusion, myocardial protection for specific clinical problems, Complications of cardioplegia. Non cardioplegic methods during cardiac surgery on ardiopulmonary bypass

9. Oxygenation – general consideration, bubble & membrane (including assessment and comparison of oxygenator function)

10. Heat exchangers-principles function of heat exchangers & their assessment. Complications related to heat exchange and their management

11. Priming fluids and hemodilution

Paper IV : Perfusion Technology – Applied

1. Blood cell trauma – analysis of forces of fluid motion, effects of physical forces on blood cell, clinical effect. Complications of blood transfusion.

2. Anti coagulation on bypass, its monitoring, its reversal and complications. Heparinless bypass. Platelet aggregation and platelet dysfunction. Coagulopathies due to cardiopulmonary bypass and its management.

5. Inflammatory response to cardiopulmonary bypass & its clinical effects. Methods to minimize the same. Immune response, neuroendocrine, renal, metabolic splanchnic response, pulmonary response and electrolyte response to cardiopulmonary bypass

4. Blood conservation hemofiltration & dialysis during cardiopulmonary bypass including modified ultra filtration reverse autologous priming and other methods

5. Micro emboli- gaseous and particulate, filters used in cardiopulmonary bypass circuit.

6. Micro pore filtration during cardiopulmonary bypass

7. Counter pulsation techniques and assist devices

PAPER V : Perfusion Technology – Advanced

1. Perfusion techniques for Paediatric cardiac surgery

5. ECMO- special perfusion techniques for special cardiac surgeries and medical conditions (including thoracic aortic surgeries deep hypothermia and circulatory arrest). Perfusion for non cardiac surgery, invasive cardiology and outside the operation suite.

3. Perfusion as a method of cardiopulmonary bypass

4. Complications and safety during cardiopulmonary bypass – bypass safety, organizational aspects, accidents, coagulpathies, mechanical and electrical failures, perfusion management, perfusion systems, safety for the perfusionist and surgical team management of perfusion accidents.

5. Minimally invasive surgery and the perfusionist

6. Recent advances in perfusion techniques

7. Experimental perfusion