Needs: Local : Pink, National : Orange, Regional: light blue, International : green

Colour Coding
Global GREEN
Regional BLUE
National ORANGE
Local (State) PINK

* Theory and practical classes/ demonstration will also be taken by Senior Residents / Technical staff working in Department of Transfusion Medicine, SGPGIMS.

TRAINING PROGRAMME

Syllabus & Curriculum

Theory classes and practical training will be distributed over 6 semesters. The classes for foundation and some common discipline specific courses will be conducted at College of Medical Technology, SGPGIMS. For the teaching of discipline specific subjects, classes will be arranged in department of Transfusion Medicine. For self direct learning and clinical education, the students will be posted in various sections and laboratories in Transfusion Medicine department, where they will engage themselves in the day to day work together with the employed Technologists. Students will participate in seminar, case presentations and maintain a log book to keep record of their day to day practical work which will be signed by the tutor/lecturers/guest faculty. Last year (7th and 8th semester) will be rotatory internship training focusing mainly on practical work. Course curriculum and syllabi for the course shall be as prescribed by Board of studies and approved by the Academic Board of the Institute from time to time. Detailed syllabus has been described in the last section.

		Class / week		Credit		End semester marks		Internal marks		
Paper	**1st Semester**	**Lecture**	**T/ P/ CT**	**Credit**	**Sum**	**Theory**	**Practical**	**Theory**	**Practical**	**Total**
Foundation 1	Introduction to Healthcare Delivery System in India	3	2	5	6	40	0	10	0	50
	Community orientation and clinical visit	0	2	1						
Foundation 2	Basic computers and information Science	2	2	3	3	40	0	10	0	50
Foundation 3	Introduction to Quality and patient safety (including Basic emergency care and life support skills, Infection prevention and control, Biomedical waste management, Disaster management and Antibiotic resistance)	2	2	3	3	40	0	10	0	50
Foundation 4	Communication and soft skills	1	2	2	4	40	0	10	0	50
	English & Communication skills	2	0	2						
Core 1	Human Anatomy and Physiology Part-1	2	6	5	5	80	80	20	20	200
Core 2	Haematology	2	6	5	5	80	80	20	20	200
				26						600
Paper	**2nd Semester**	**Lecture**	**T/ P/ CT**	**Credit**	**Sum**	**Theory**	**Practical**	**Theory**	**Practical**	**Total**

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Foundation 5	Medical Terminology and record keeping (including anatomical terms)	2	2	3	3	80	0	20	0	100
Foundation 6	Medical Law and Ethics	3	0	3	9	80	0	20	0	100
	Professionalism and values	2	2	3						
	Principals of Management	3	0	3						
Core 3	Human Anatomy and Physiology Part-2	2	4	4	4	80	80	20	20	200
Core 4	Biochemistry	2	6	5	5	40	40	10	10	100
Core 5	Blood Centre Organization	2	6	5	5	40	40	10	10	100
				26						600
Paper	**3rd Semester**	**Lecture**	**T/P/CT**	**Credit**	**Sum**	**Theory**	**Practical**	**Theory**	**Practical**	**Total**
Foundation 7	General Pathology	2	2	3	6	40	40	10	10	100
	General Microbiology	2	2	3						
Core 6	Blood donation and donor management	3	10	8	8	80	80	20	20	200
Core 7	Basic Immunohematology	3	10	8	8	80	80	20	20	200
Foundation 8	Research Methodology & Biostatistics Part 1	3	2	4	4	80	0	20	0	100
				26						600
Paper	**4th Semester**	**Lecture**	**T/P/CT**	**Credit**	**Sum**	**Theory**	**Practical**	**Theory**	**Practical**	**Total**
Foundation 9	Research Methodology part 2	3	4	5	5	80	0	20	0	100
Core 8	Transfusion Transmitted Infection	4	12	10	10	80	80	20	20	200
Core 9	Blood Component preparation, storage and Quality control	5	12	11	10	80	80	20	20	200
				26						500
Paper	**5th Semester**	**Lecture**	**T/P/CT**	**Credit**	**Sum**	**Theory**	**Practical**	**Theory**	**Practical**	**Total**
Core 10	Hemotherapy	6	12	12	12	80	80	20	20	200
Core 11	Blood Bank Equipment, Documentation & Quality Control	6	12	12	7	80	80	20	20	200

Colour Coding
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National ORANGE
Local (State) PINK

				24						400
Paper	**6th Semester**	**Lecture**	**T/P/CT**	**Credit**	**Sum**	**Theory**	**Practical**	**Theory**	**Practical**	**Total**
Core 12	Apheresis	6	12	12	12	80	80	20	20	200
Core 13	Recent Advances	6	12	12	12	80	80	20	20	200
Total				24						400

T /P / CT – Tutorial / Practical / Clinical training

*Students will be posted in various areas of the department on rotation basis in the remaining time (after lectures / Tutorials /practical) under supervision of technical staff / guest faculties for self-directed learning, clinical training and education.

7th and 8th Semester (INTERNSHIP)

A student can only start internship after clearing all papers of 1st to 6th semester as per the schedule prescribed (pass / promotion rules), and his/her conduct has to be good throughout this duration. Total 15 days leave will be given to the student during internship, not more than 7 day at a stretch.

Students have to undertake the rotational postings during which students have to work under supervision of an experienced staff in the following areas.

S. No.	Posting		Credit
1	Blood donation complex	2 months	9
2	Component lab	2 months	9
3	Cross match lab	2 months	8
4	Quality lab	1 months	4
5	NAT lab	1 months	4
6	TTI screening lab	2 months	9
7	Immunohematology lab	2 months	9
	Total	**12 months**	**52**

At the end of each posting the student has to get certified in the log book from the supervising staff regarding their satisfactory performance, punctuality and conduct.
Grade point will be given at the end of each posting (0-10 scale) for credit score calculation.
If the student has not attended the internship posting or his performance has not been satisfactory, that posting will be repeated.

ATTENDANCE (As per CMT rule)

Secured minimum 80% attendance in overall with at least; 75% attendance in theoretical and 80% in Skills training (practical).

Condonation for Attendance

Condonation may be granted by the Principal/Nodal Officer to the extent of 10% in exceptional cases i.e. serious illness & hospitalization, accident, mishap in the family or deputation by the college for any specific work for which the period of his/her absence shall not be counted towards the calculation of attendance on the condition that students concerned submit a certificate to that effect from the appropriate authority.

EXAMINATION (As per CMT)

(a) Internal assessment (IA)

It is essential to monitor the learning progress of each candidate through continuous appraisal and regular assessment. It not only helps teachers to evaluate students, but also students to evaluate themselves. The monitoring shall be done by the staff of the department based on participation of the student in various teaching / learning activities. The institute will conduct internal assessment exams based on pattern set by the College of medical technology, SGPGIMS. One internal assessment will be conducted in each semester after completion of about 75% of syllabus and at least a month before end semester exam.

Internal Assessment will be conducted at the level of course coordinator. A student who fails to appear in an internal assessment examination due to valid reason will be allowed one more chance to take the same examination.

Weightage of the Internal assessment will be 20% of the total marks of the particular paper.

Internal assessment may or may not include a practical, will be as per the curriculum defined. Theory marks of internal assessment will be added in the final semester theory marks. Similarly, practical marks of internal assessment will be added into the final semester practical marks. Marks of logbook, seminar and case presentation will be added in the practical marks of internal assessment.

(b) Log book /Seminar

Every candidate shall maintain a log book for prescribed subjects. Students will maintain record of their day to day practical work/ clinical posting which will be signed by the tutor/lecturers/guest faculty. In additional the student will document seminars and the important blood transfusion procedures and topics as suggested / assigned by the guest faculty / tutor. The log book shall be scrutinized and certified by the concerned faculty and course co-ordinator and will be presented in the final examination. 5 marks have been allotted for the log book which will be added in the practical marks of the internal assessment, which will be added into practical marks of final examination. Students will be encouraged to present seminars and journal clubs. 10 marks will be given based on the content of presentation, fluency and ability to explain the topic and will be included in internal assessment practical marks.

(c) End semester examination:

There shall be a 6 monthly end semester examinations, one each at the end of each semester. Candidate shall be required to appear in every paper of the semester as specified in course. Practical exams will be conducted for relevant papers as mentioned in curriculum. Practical exam will be divided in spotting / performance of procedures and table viva.

Type & number of questions for theory examination (As per CMT rule)

There shall be one theory examination for each course specific paper and foundation paper. The duration of theory external examination will be of 3 hours. Distribution of type of questions shall be as given below:

1. Long answer types 06 (to attempt 05) - marks for each long answer question will be 10% of total marks for that paper.
2. Short answer types 12 (to attempt 10) - marks for each short answer question will be 5% of total marks for that paper.

Allotment of marks (As per CMT rule)

The allotment of marks in final examination should include theory, practical and internal assessment as mentioned in the curriculum table.

Computation of SGPA and CGPA (As per CMT rules)

(a) Table for conversion of percentage into grade points

Level	Out-standing	Excellent	Very Good	Good	Above Average	Average	Pass	Fail	Absent
Letter Grade	O	A+	A	B+	B	C	P	F	Ab
Marks %	90.1-100	80.1-90	70.1-80	60.1-70	55.1-60	50-55	Passed with grace	< 50	0
Grade Points	10	9	8	7	6	5.5	5	0	0

Credit score of a particular paper = Grade point X Credits

(b) SGPA (Semester grade point average) is the ratio of sum of the product of the number of credits with the grade points scored by student in all the paper, the sum of the number of credits of all the courses undergone by a student.

$$\text{SGPA} = \frac{\text{Sum of credit scores of all papers of a semester (grade point scored x credits)}}{\text{total credit points for that semester}}$$

(c) The CGPA (Cumulative Grade Point Average) is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of the course.

(d) The SGPA shall be calculated at end of each semester and CGPA shall be calculated after clearing all papers of 1st to 6th semesters and shall be rounded off to 2 decimal places.

APPOINTMENT OF EXAMINERS (As per CMT rules)

All examiners will be appointed by In-charge examination cell, from the list of examiners approved in the respective courses.

1. Convenor – Head, Department of Transfusion Medicine, SGPGIMS, Lucknow
2. Theory: The board of examiners for end semester theory examination shall consist of 50% external and 50% internal examiners.
3. For the practical examination there shall be one internal (of the institute) and one external examiner.

   Internal examiner (01)– Course coordinator, Department of Transfusion Medicine, SGPGIMS / Faculty, Department of Transfusion Medicine, SGPGIMS, Lucknow / Faculty, College of Medical Technology, SGPGIMS, Lucknow.

   External examiner (01) - Tutor / Lecturer / faculty working in department of Transfusion Medicine) of a teaching hospital, or paramedical college belonging to the particular specialty.

Eligibility of examiner: Minimum 5 years teaching experience after postgraduation.

RE-CHECKING / RETOTALLING OF ANSWER PAPERS

In accordance to rules and regulation setup by the CMT, SGPGIMS, Lucknow.

PASS, PROMOTION, RETAINED CRITERIA & BACKLOG (As per CMT rules)

In accordance to rules and regulation setup by the CMT, SGPGIMS, Lucknow.

Re-admission after break of study: (As per CMT rules)

Re-admission and study break rules with be in accordance to rules and regulation setup by the CMT, SGPGIMS, Lucknow. Maximum time to complete the course (1st to 6th semester and 1 year internship) will remain 8 years from the date of admission including time to clear backlog papers and breaks if any.

Results:

1. The Sanjay Gandhi Postgraduate Institute of Medical Science, Lucknow, will publish the result of examination as soon as possible after the examination has been held.
2. Successful candidate shall be classified as under on the basis of aggregate marks obtained in all the papers of semester:
   (a) Those who obtain 60% or more — 1st Division
   (b) Those who obtain less than 60% — 2nd Division
   (c) Those who obtained 75% or more marks in the paper — Distinction in paper/s concerned
3. Backlog attempts will be mentioned in the result.

Award of Degree: (As per CMT rules)

The degree will be awarded to the candidate only after he/she completes the following:

(a) Has passes all the examination of 1st to 6th semester.
(b) Has completed the one year internship (7th and 8th semester).
(c) His/her work and conduct during the period of training have been satisfactory.
(d) Degree will be awarded at the convocation held at the institute after completion of the course and candidate is declared pass.

Cancellation of admission (As per CMT rules)

The admission of a student at any stage of study shall be cancelled if :

(a) He / She is not found qualified as per AICTE / State Government norms and guidelines or the eligibility criteria prescribed by the CMT, SGPGIMS, Lucknow

(b) He / She is found unable to complete the course within the stipulated time as prescribed above.

(c) He / She is found involved in creating indiscipline in the Institution / College.

In addition to above rules, all other rules and regulations formed by CMT / SGPGIMS Lucknow will be applicable and is subject to change as per decision of Institute time to time.

Summer and winter vacation: (As per CMT rules)

Summer and winter vacation will be given in accordance to rules and regulation setup by the CMT, SGPGIMS, Lucknow.

Skills based outcomes and monitorable indicators for Transfusion Medicine Technologists

Competency statements

1. Should be able to perform blood donor phlebotomy, pre transfusion testing, transfusion transmitted infection screening, immunohematological testing independently and assist in donor apheresis and therapeutic plasma exchange.
2. Able to prepare, store and do the quality testing on blood and components.
3. Should be able to handle all equipment in transfusion services independently and undertake care and maintenance of equipment.
4. Should ensure radiation protection during blood irradiation and quality assurance.
5. Able to receive and document patient blood requisitions and samples
6. Should have computer skills.
7. Should follow guidelines of Drugs and Cosmetics Act regarding documentation, biomedical waste and blood safety
7. Students will demonstrate quality patient / blood donor care skills including professionalism and ethical behaviors as specified in the code of ethics
8. Demonstrates knowledge and skills to carry out the daily/weekly Quality Control (QC) checks
9. Participates in research activities

ANNEXURE – III

List of external experts / examiners for B.Sc. in Transfusion Medicine Technology

SN	Name	Email	Mobile No
1	Dr Archana Solanki, MD Addl Prof, Dept of Transfusion Medicine, KGMU, Lucknow	archana.solanki@gmail.com	8979438922
2	Dr Ashutosh Singh, MD Addl Prof, Dept of Transfusion Medicine, KGMU, Lucknow	drashullrm@gmail.com	9412836605
3	Dr Ashish Jain, MD Asstt Prof, Dept of Transfusion Medicine, AIIMS, Rishikesh	ashish.jain.modi@gmail.com	9917817515
4.	Dr Hem Chandra Pandey, MD Assoc Prof, Dept of Transfusion Medicine, AIIMS, New Delhi	pandeyhemc@gmail.com	9532993308
5.	Dr Rahul Chaurasia, MD Assoc Prof, Dept of Transfusion Medicine, AIIMS, New Delhi	drrahulchaurasia@gmail.com	9560345917
6.	Dr. Dnyaneshwar Patale, MD Asstt Prof, Dept of Transfusion Medicine, AIIMS, Raibareli	dnyaneshwar.patale@gmail.com	8850112287
7.	Dr Saurabh Murti, MD Asstt Prof, Dept of Transfusion Medicine, AIIMS, Gorakhpur	drsaurabhmurti@hotmail.com	6392418566
8.	Dr Shashank Ojha, MD Transfusion Medicine ATRECT, Kharghar, Navi Mumbai, Maharashtra 410210	ojhashashank3@gmail.com	8655989152
9	Dr Somnath Mukherejee, MD Addl Prof, Dept of Transfusion Medicine, AIIMS, Bhubaneswar	somfusion@yahoo.co.in	9438884262
10	Dr Archana Bajpai, MD Addl Prof, Dept of Transfusion Medicine, AIIMS, Jodhpur	drarchanabajpai@yahoo.co.in	8003996943

ANNEXURE - II

1st Semester

Foundation 1	BMLT (TMT)	Introduction to Healthcare Delivery System in India
	BMLT (TMT)	Community orientation and clinical visit

Introduction to healthcare delivery systems in India

Course Objectives

The course provides the students a basic insight into the main features of Indian health care delivery system and how it compares with the other systems of the world.

Detailed Syllabus

Section I		
		Theory
1	**Introduction to healthcare delivery system** a. Healthcare delivery system in India at primary, secondary and tertiary care b. Community participation in healthcare delivery system c. Health system in developed countries. d. Private Sector e. National Health Mission f. National Health Policy g. Issues in Health Care Delivery System in India	8
2	**National Health Programme** Background objectives, action plan, targets, operations, achievements and constraints in various National Heath Programme.	8
3	**Introduction to AYUSH system of medicine** a. Introduction to Ayurveda. b. Yoga and Naturopathy c. Unani d. Siddha e. Homeopathy f. Need for integration of various system of medicine	8
Section II		
4	**Health Scenario of India- Past, Present and Future**	8
5	**Demography & Vital Statistics.** a. Demography – its concept b. Vital events of life & its impact on demography c. Significance and recording of vital statistics d. Census & its impact on health policy	10
6	**Epidemiology** a. Principles of Epidemiology b. Natural History of disease c. Methods of Epidemiological studies d. Epidemiology of communicable & non-communicable diseases, disease transmission, host defence immunizing agents, cold chain, immunization, disease monitoring and surveillance.	10

Practical sessions:

Posting in various areas of hospital and clinics to understand the concept of health system and disease.

Text Books

K Park 2005, "The Text book of Preventive Medicine" 18th edition

Community orientation and clinical visit		
Course Objectives		
The objective of this particular section of the foundation course is to sensitize potential learners with essential knowledge of healthcare delivery.		
Detailed Syllabus		**Sessions**
Section I		
1.	The community orientation and clinical visit will include visit to the entire chain of healthcare delivery system -Sub centre, PHC, CHC, SDH, DH and Medical College, private hospitals, dispensaries and clinics.	10
2.	The student will also be briefed regarding governance at village level including interaction and group discussion with village panchayat and front line health workers.	15
Section II		
3.	Clinical visit to their respective professional department within the hospital.	5

Foundation 2	BMLT (TMT)	Basic computers and information Science
Basic Computers and information Science		
Course Objectives		
The students will be able to appreciate the role of computer technology. The course has focus on computer organization, computer operating system and software, and MS windows, Word processing, Excel data worksheet and PowerPoint presentation.		
	Detailed Syllabus	**Lecture**
Section I		
1	**Introduction to computer:** Introduction, characteristics of computer, Block diagram of computer, Generations of computer, Computer languages.	2
2	**Input output devices: Input devices** Keyboard, Point and draw devices, Data scanning devices, Digitizer, Electronic card reader, Voice recognition devices, Vision-input devices **Output devices** Monitors, pointers, plotters, screen image projector, Voice response systems.	2
3	**Processor and memory:** The Central Processing Unit (CPU), Main memory	1
4	**Storage Devices:** Sequential and direct access devices, magnetic tape, magnetic disk, optical disk, Mass storage devices.	2
5.	**Introduction of Operating System:** Introduction, Operating system concepts, Types of operating system.	2
6	**Computer networks:** Introduction, Types of network (LAN, MAN, WAN, Internet, Intranet), Network topologies (star, ring, bus, mesh, tree, hybrid), Components of network.	2
7	**Introduction of windows:** History, features, Desktop, Taskbar, Icons on the desktop, Operation with folder, Creating shortcuts, Operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.)	3

Section II		
8	**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.	4
9	**Introduction to Excel:** Introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs	4
10	**Introduction to power-point:** Introduction, creating and manipulating presentation, views, formatting and enhancing text, Slide with graphs.	4
11	**Internet and its Applications:** Definition, Brief history, Basic services (E-Mail, File Transfer Protocol, telnet, World Wide Web (WWW), www browsers, Use of the internet, Install different software, Data entry	4
12	**Application of Computers in clinical settings**	1

Practical on fundamentals of computers -

1. Demonstration of basic hardware of the computers and laptops
2. Learning to use MS office: MS word, MS PowerPoint, MS Excel
3. To install different software
4. Data entry efficiency

Books

1. Basic computer application: Parvez Faruki, Manoj Parmar and Nandu Fatak; Mahajan
2. P.C. Software for Windows 98 made simple: Taxali R.K.; Tata McGraw-Hill publishers
3. Computer fundamentals: Pradeep K. Sinha and Priti Sinha; BPB publication
4. Computer Basics For BMLT, Pooja Jain

Foundation 3	BMLT (TMT)	Introduction to Quality and patient safety including basic emergency care & LSS, infection control

Course Objectives

The objective of the course is to help students understand the basic concepts of quality in health Care and develop skills to implement sustainable quality assurance program in the health system.

To learn about basic emergency care including first aid and triage.

To learn about prevention of harm to workers, property, the environment and the general public

To provide a broad understanding of the core subject areas of infection prevention and control and to equip AHPs with the fundamental skills required to reduce the incidence of hospital acquired infections.

Detailed Syllabus		Lecture
Section I		
1	**Quality assurance and management** a. Concepts of Quality of Care b. Quality Improvement Approaches c. Standards and Norms d. Quality Improvement Tools e. Introduction to NABH guidelines	3
2	**Basics of emergency care and life support skills** a. Vital signs and primary assessment b. Basic emergency care – first aid and triage c. Ventilations including use of bag-valve-masks (BVMs) d. Choking, rescue breathing methods e. One- and Two-rescuer CPR f. Using an AED (Automated external defibrillator). g. Managing an emergency including moving a patient	6
3	**Bio medical waste management and environment safety** a. Definition of Biomedical Waste b. Waste minimization c. BMW – Segregation, collection, transportation, treatment and disposal (including color coding) d. Liquid BMW, Radioactive waste, Metals / Chemicals / Drug waste e. BMW Management & methods of disinfection f. Modern technology for handling BMW g. Use of Personal protective equipment (PPE) h. Monitoring & controlling of cross infection (Protective devices)	6
Section II		
4	**Infection prevention and control** a. Evidence-based infection control principles and practices [such as sterilization, disinfection, effective hand hygiene and use of Personal protective equipment (PPE)], b. Prevention & control of common healthcare associated infections, c. Components of an effective infection control program, d. Guidelines (NABH and JCI) for Hospital Infection Control	5
5	**Antibiotic Resistance** a. History of Antibiotics b. How Resistance Happens and Spreads c. Types of resistance- Intrinsic, Acquired, Passive d. Trends in Drug Resistance e. Actions to Fight Resistance f. Bacterial persistence g. Antibiotic sensitivity h. Consequences of antibiotic resistance i. Antimicrobial Stewardship- Barriers and opportunities, Tools and models in hospitals	5
6	**Disaster preparedness and management** a. Fundamentals of emergency management,	5

	b. Psychological impact management, c. Resource management, d. Preparedness and risk reduction, e. Key response functions (including public health, logistics and governance, recovery, rehabilitation and reconstruction), information management, incident command and institutional mechanisms.	

Practical sessions:

The students will be taught to perform the maneuvers in simulation lab and to test their skills with focus on airways management and chest compressions. At the end of the foundation course, each student should be able to perform and execute/operate on the above mentioned modalities.

Books

1. The Essentials of Patient Safety by Charles Vincent
2. Laboratory quality control and patient safety by De Gruyter

Foundation 4	**BMLT (TMT)**	**Communication and soft skills**
	BMLT (TMT)	**English & Communication skills**

Course Title	**Communication and soft skills**	
Course Objectives		
1. To learn the effective communication skills, and use communication as a major tool in the clinical practice. 2. To know the technologist and patient relationship.		
Detailed Syllabus		**Lectures**
SECTION I		
1.	**Basic Language Skills: Grammar and Usage.**	3
2.	**Communication Skills. With focus on speaking –** Conversations, discussions, dialogues, short presentations, pronunciation	3
3.	**Teaching the different methods of writing like** letters, E-mails, report, case study, Collecting the patient data etc. Basic compositions, journals, (with a focus on paragraph form and organization)	5
SECTION II		
4.	Basic concepts & principles of good communication	2
5.	Special characteristics of health communication	2
6.	Types & process of communication	3
7.	Barriers of communication & how to overcome	3

Practical:

1. Practice writing and simple passage from a prescribed text books. Atleast100 words should be chosen and few questions from the passage may be said to answer.

2. To practice all forms communication i.e. drafting report, agenda notes, précis writing, telegram, circular, representations, press, release, telephonic communication, practice of writing resume and writing application of employment.		
Books: 1. Effective Communication and Soft Skills by Nitin Bhatnagar Pearson Education India, 2011 2. Communication N Soft Skills Paperback – 2014 by Niraj Kumar, Chetan Srivastava		
Course Title	**ENGLISH AND COMMUNICATION SKILLS**	
Course Learning Outcomes.		
To speak and write proper English , to read and understand English, to understand and practice medical terminology		
Detailed Syllabus		
Section – I		**Lecture**
1	Letter writing	8
2	Note making	7
Section II		
3	Essay writing	7
4	Report writing	8
Practical:		
1. Students will be encouraged to speak in English by role playing. 2. Surprise tests/Quizzes/Tutorials will be conducted.		
Books: 1. Collins, English grammar 2. Wren & Martin High School English Grammar and Composition Book 3. Letters for All Occasions by Alfred S Myers 4. Spoken English by V Sasikumar, P V Dhamija 5. Journalism (Made Simple Books) by David Wainwright		

Core 1	BMLT (TMT)	Human Anatomy and Physiology Part-1
Course Objectives		
The course provide the students understanding of the structure and relationships of the systems and organs of the body which is essential in patient preparation and positioning. The radiographic anatomy component will enable MRITs to evaluate images prior to reporting by the radiologist.		
Detailed Syllabus		**Lectures**

Section I		
1	Introduction to the body as a whole	1
2	The cells, tissues of the body	3
3	The cell: Structure, multiplication.	2
4	Tissue: Types, structure, characteristics, functions	2
5	Epithelium Simple : Squamous, Cuboidal, columnar, ciliated Compound: Stratified, transitional Connective: Areolar, adipose, fibrous, elastic, Cartilage, blood and bone	3
6	Muscle: Striated (Voluntary), Smooth (Involuntary, Cardiac)	2
7	Nervous tissue	2
8	Fibrous tissue	1
9	Cell regeneration	1
10	Membranes: Mucous, Serous, Synovial	1
SECTION-2		
11	Osteology (including whole Skelton, bones and joints)	2
12	Development of bone (osteogenesis) : Cells involved	2
13	Types and functions of bone, Types of joints and various movements	2
14	AXIAL Skeleton: Skull : Cranium, face, air sinuses, Vertebral column: regions, movements and characteristics, Sternum, Ribs	3
15	Appendicular Skelton: Bones involving -Shoulder girdle and Upper limb, Pelvic girdle and lower limb	4
16	Healing of bones: cellular activity, Factors that delay healing, Diseases of bones and joints.	2
17	The Respiratory System: Organs: Position and structure, Nose and nasal cavities, Functions: respiratory, Olfactory, Pharynx, and Larynx: Functions - respiratory, vocal, Trachea, Bronchi, lungs: lobes, lobules, pleura, and respiratory functions: External and internal respiration, common terms relating to disease and conditions of the system.	3

Practical:

Human Anatomy & Physiology – Practical

(Note: Demonstrations can be done with the help of models, charts and histological slides)

1. Demonstration of various parts of body
2. Demonstration of tissues of body
4. Demonstration of parts of respiratory system
5. Examination of blood film for various blood cells from stained slides
6. Blood pressure estimation
7. Demonstration of structural differences between skeletal, smooth and cardiac muscles (permanent mounts)
8. Demonstration of various bones and joints, Radiographic appearance of bones, Study of Human Skeleton parts with skeletal models

Reference Books

1. Anatomy and Physiology for Radiographers- C.A. Werrick
2. Imaging Atlas of Human Anatomy – JamieWeir et all (Mosby-Elsevier)
3. An Atlas of Normal Radiographic Anatomy – Richard and Alwin.
4. Surface and Radiological Anatomy – Hamilton et al (Heffer)
5. An Atlas of normal radiographic Anatomy – Ross and Wilson

6. Foundation of anatomy and physiology, Ross and Wilson, Churchill Livingstone
7. Surface anatomy for radiographer, Mekears and Owen, Blackwell Scientific
8. Radiographic anatomy of human skeleton, Bryan G, Livingstone
9. Basics of Medical Physiology, Venkatesh

Core 2	BMLT (TMT)	Lab Haematology related to transfusion medicine

Course Objectives

The students will be able to understand the basics of laboratory hematology related to transfusion medicine including practical skills.

Detailed Syllabus		Lectures
1	1. Blood collection 2. Anticoagulants used in Hematology 3. Normal values in Hematology 4. Basic Hematological Techniques: RBC count, Hemoglobin estimation, Packed cell volume. 5. Calculation of absolute indices: WBC counts-Total and differential, Absolute eosinophil count, Platelet count, Erythrocyte sedimentation rate, Reticulocyte count 6. Preparation of blood films 7. Stains used in Hematology 8. Morphology of blood cells 9. Classification of Anemia (Morphological & etiological), Definition, causes, classification & lab findings of Iron Deficiency Anemia, Megaloblastic Anemia, Hemolytic Anemia 10. Bone Marrow: Cell composition of normal adult Bone marrow 11. Leukemia: Classification 12. Examination of body fluids, cell counts	2 per week

Practical sessions:

- Demonstration on various laboratory equipments, preparation of smear, cell counts

Books

1.Practical Hematology, J A Dacie and S M Lewis

2. Medical laboratory Procedure Manual (T-M) by K.L. Mukherjee 1987, Vol.I, II & III Tata McGraw Hill Publication.

3. Technical Manual, DGHS,

2nd Semester

Foundation 5	BMLT (TMT)	Medical Terminology and record keeping (including anatomical terms)

Course Objectives

This course introduces the elements of medical terminology. Emphasis is placed on building familiarity with medical words through knowledge of roots, prefixes, and suffixes. Topics include: origin, word building, abbreviations and symbols, terminology related to the human anatomy, reading medical orders and reports, and terminology specific to the student's field of study. Spelling is critical and will be counted when grading tests.

Detailed Syllabus

Section I		Lectures
1	Derivation of medical terms.	
2	Define word roots, prefixes, and suffixes.	3
3	Conventions for combined morphemes and the formation of plurals.	3
4	Basic medical terms.	3
5	Form medical terms utilizing roots, suffixes, prefixes, and combining roots	3
SECTION II		3
6	Interpret basic medical abbreviations/symbols.	
7	Utilize diagnostic, surgical, and procedural terms and abbreviations related to the Integumentary system, Musculoskeletal system, Respiratory system, Cardiovascular system, Nervous system, Endocrine system	3 6
8	Interpret medical orders/reports.	
9	Data entry and management on electronic health record system.	3 3

Practical session:

Familiarize students with the hospital information system including data entry of case records in the system.

Books

1. The Language of Medicine, 10th Edition: Davi-Ellen Chabner BA MAT

Foundation 6	BMLT (TMT)	Medical Law and Ethics Professionalism and values Principals of Management

Course Title — **Medical law and ethics**

Course Learning Outcomes.

To improve the quality of patient care by identifying, analyzing, and attempting to resolve the ethical problems that arise in practice

Legal and ethical considerations are inherent and inseparable parts of good medical practice across the whole spectrum.

Detailed Syllabus

Section I	Lectures

1	Medical ethics - Definition - Goal - Scope	4
2	Introduction to Code of conduct	4
3	Basic principles of medical ethics – Confidentiality	3
4	Malpractice and negligence - Rational and irrational drug therapy	4
5	Autonomy and informed consent - Right of patients	4
6	Care of the terminally ill- Euthanasia	3
Section II		
7	Organ transplantation	3
8	Medico legal aspects of medical records Medico legal case and type Records and document related to MLC Ownership of medical records Confidentiality Privilege communication Release of medical information Unauthorized disclosure Retention of medical records Other various aspects.	8
9	Professional Indemnity insurance policy	2
10	Development of standardized protocol to avoid near miss or sentinel events	3
11	Obtaining an informed consent	2

Practical:
Demonstrate the process of obtain informed consent, record keeping of medical cases

Books:
1. Medical Law and Ethics by Bonnie F Fremgen
2. Medical Law and Ethics by Jonathan Herring

Course Title	**Professionalism and values**

Course Objectives

The module on professionalism will deliver the concept of what it means to be a professional and how a specialized profession is different from a usual vocation. It also explains how relevant is professionalism in terms of healthcare system and how it affects the overall patient environment.

Detailed Syllabus		**Lectures**
Section I		
1.	**Professional values** Integrity, Objectivity, Professional competence and due care, Confidentiality	5
2.	**Personal values**- ethical or moral values	5
3.	**Attitude and behaviour**- professional behaviour, treating people equally	5
Section II		
4.	Code of conduct, professional accountability and responsibility, misconduct	5
5.	Differences between professions and importance of team efforts	5
6.	Cultural issues in the healthcare environment	5

Books

Radiography: Technology, Environment, Professionalism: Campeau, Frances

Course Title	**Principles of management**

Course Objectives		
The course is intended to provide a knowledge about the basic principles of Management.		
Detailed Syllabus		Lectures
Section I		
1	Introduction to management	2
2	Strategic Management	4
3	Foundations of Planning	2
4	Planning Tools and Techniques	6
5	Decision Making, conflict and stress management	6
Section II		
6	Managing Change and Innovation	2
7	Understanding Groups and Teams	4
8	Leadership	5
9	Time Management	5
10	Cost and efficiency	4
Books		

Core 3	BMLT (TMT)	Human Anatomy and Physiology Part-2
Course Objectives		
The course provides the students understanding of the structure and relationships of the systems and organs of the body. The anatomy component will enable students to evaluate phlebotomy area prior to phlebotomy. Introduction to system and cavities of the body.		
Detailed Syllabus		**Lectures**
Section I		
1	**Heart and blood vessels (Circulatory system):** a. Blood vessels: arteries, veins, capillaries, sinusoids, structure and functions b. Heart: Position, structure and functions c. Circulation of blood: pulmonary, systemic, portal, main blood vessels, their origins and distribution.	3
2	**The Lymphatic system:** a. The parts of the lymphatic system. b. Lymph channels: Capillaries, vessels, ducts structure and functions c. Lymph nodes: position, structure and functions d. Lymphatic tissues: tonsils, adenoids, intestinal nodules e. Spleen: position, structure and functions	2
3	**The digestive system:** a. Elementary tract structure: b. Mouth, pharynx, salivary glands, oesophagus, stomach, liver, gall bladder, small intestine, large intestine (Position, structure and functions of these organs.) c. Digestion and absorption, Metabolism of carbohydrates. Proteins and fats.	4
4	**The Urinary System:** Diseases and conditions of the system a. Parts of urinary system b. Position, structure and functions c. Kidneys, ureters,	3

	urinary bladder and urethra d. Formation and composition of urine e. Water and electrolyte balance	
5	**The reproductive system: Diseases of female and male reproductive system.** **a. Female reproductive system:** External genitalia: positions and structures and functions. Perineum. Internal organs: positions and structures. Vagina, uterus, uterine tubes, ovaries. Menstrual cycle" stages, hormone control, ovulation. Breasts (Mammary glands) Changes: puberty, in pregnancy, during lactation. **b. Male reproductive system:** Scrotum, testis, epididymis: positions. Spermatogenesis, Spermatic Cords, seminal vesicles, Ejaculatory ducts: position, structure & functions Prostate gland: position Functions of male reproductive system, puberty	4
6	**The Endocrine system:** a. Endocrine glands: b. Pituitary and hypothalamus: Position & structure c. Thyroid gland, parathyroid glands d. Adrenal (supra renal) glands e. Pancreases: Position, types of cells f. Hormones: secretion, function and control, pineal gland g. Common terms and diseases related to the system	3
7	**The organs of sense:** a. Hearing and the ear: b. External, middle and inner ear c. Physiology of hearing and diseases of ear. d. Sight and the eye: position, structure, sclera, cornea, choroid, ciliary body. e. Iris, lens, retina, optic nerves f. Physiology of sight and diseases of the eye.	3
8	**Sense of smell:** a. Olfactory nerves, origins, distribution b. Physiology of smell c. Sense of taste : tongue	2
9	**The nervous system: Common diseases of the system.** a. Neurons: Structure, types and properties b. Central nervous system: neurons, neuralgia meninges. c. Ventricles of brain, CSF d. Brain, spinal cord: structures, functions, peripheral nervous system. e. Spinal and cranial nerves: origin distribution and functions. f. Automatic nervous system g. Sympathetic and para sympathetic: origin distribution and function.	4
10	**The Skin:** a. Structure of skin	2

	b. Epidermis, dermis c. Functions of skin d. Hypothermia e. Wound healing: primary and secondary diseases of skin	
11	Cross-sectional anatomy related to Ultrasound, CT and MRI techniques.	2

Practical sessions:

1. Demonstration of parts of digestive system
2. Demonstration of parts of skin
3. Demonstration of parts of excretory system
4. Demonstration of various parts of circulatory system
5. Demonstration of various parts of nervous system (brain and spinal cord)(Model)
6. Structure of eye and ear (demonstration from models)
7. Demonstration of reflex action
8. Demonstration of various parts of reproductive system (Male and female from models and charts)

Books

1. Textbook of Medical Physiology by G.K. Pal.
2. Review of Medical Physiology by Ganong.
3. Basic molecular and cell biology. David Latchman. BMJ Publishing group, 1997.

Core 4	BMLT (TMT)	Biochemistry
Course Title	**BSc MLT (Transfusion Medicine Technology)**	
Course Objectives		
Students should understand the basic concepts of biochemistry, interpretation of various investigation results and its correlation with patient / blood donor.		
	1. Introduction to Apparatus, Chemical Balance: Different types, Principles and Practice. 2. Concepts of Molecular weight, Atomic weight, Normality, Molarity, Standards, 3. Atomic structure, Valence, Acids, Bases, Salts, & Indicators. 4. Chemistry of carbohydrates & their related metabolism: Introduction, definition, classification, biomedical importance & properties. 5. Brief outline of metabolism: Glycogenesis & glycogenolysis, Glycolysis, Citric acid cycle & its significance, HMP shunt & Gluconeogenesis, regulation of blood glucose level, Hyperglycemia & hypoglycemia, Diabetes mellitus - definition, types, features, gestational diabetes mellitus , glucose tolerance test, glycosurias, Hypoglycemia & its causes 6. Amino acids: Definition, classification, essential & non essential amino acids. 7. Chemistry of Proteins & their related metabolism: Introduction, definition, classification, biomedical importance. 8. Metabolism: Transamination, Decarboxylation, Ammonia formation & transport, Urea cycle, metabolic disorders in urea cycle, catabolism of amino	2 per week

	acids especially Phenylalanine, Tyrosine & Tryptophan, Creatine, Creatinine, Proteinuria. 9. Chemistry of Lipids & their related metabolism: Introduction, definition, classification, biomedical importance, essential fatty acids. 10. Brief out line of metabolism: Beta oxidation of fatty acids, Fatty acid synthesis, Ketosis, Cholesterol & its clinical significance. Lipoproteins-composition & functions, Fatty liver & Atherosclerosis. 11. Chemistry of Nucleic acids: DNA Structure and function, RNA Types: Structure and function. 12. Vitamins: Fat & water soluble vitamins, sources, requirement, deficiency disorders & biochemical functions. 13. Enzymes: Introduction, definition, classification, coenzymes, isoenzymes, properties, factors affecting enzyme action, enzyme inhibition, diagnostic value of serum enzymes	

Practical session:

- Demonstration of various equipment related to biochemical investigations and interpretation of test results. Preparation of solutions, calculation of Molecular Weights and Equivalent Weights, Preparation of Normal solutions, percent solution and reagents, dilution techniques.

Books

1. Text book of Medical Biochemistry by Ramakrishna
1. Clinical Chemistry - Principle and techniques by RJ Henry, Harper & Row Publishers.
2. Text Book Biochemistry by Vasudevan and Sree Kumari

Core 5	BMLT (TMT)	BLOOD CENTRE ORGANIZATION	
Course Title	**BSc MLT (Transfusion Medicine Technology)**		
Course Objectives			
Students should understand the organization of blood transfusion services, storage blood centers, rules and regulations in blood banking			
	1. History of Transfusion Medicine 2. Identify and relate the important features of the history of transfusion medicine 3. Outline the scientific benchmarks in the evolution of transfusion medicine 4. Explain how specific innovations affected transfusion medicine practice 5. Describe recent trends in the practice of transfusion medicine 6. History of development Transfusion Medicine in India- Whole blood, Components & Apheresis, Recent developments – 7. Organization of blood bank services regional blood transfusion centre, Blood banks and blood storage centres, Blood Bank premises and infrastructure. Mandatory Technical Staffing pattern of blood bank and role, functions and responsibility of each technical staff. 8. Technical requirements: Accommodation and environmental conditions,		2 per week

	Blood bank management system, Regulations for blood bank operation, Drugs and cosmetics Law, National blood policy, standards in Blood Banking, licensing procedures, ethical aspects of blood transfusion 9. Statutory regulators of Blood banking in India- Drug controller of India, State, Director General Health services & NACO. 10. Indian Drugs and cosmetic act and rules 1945 pertaining to Blood bank. 11. Indian & other Pharmacopeia pertaining to blood products. 12. Licensing norms, Inspections and Compliance. 13. Terminologies used in blood banking including blood donation. 14. Introduction blood and blood products. 15. Introduction to Blood bank equipment 16. Weights, Volume. Specific gravity, Conversion of weight to volume, Volume dilutions, Weight dilutions etc. 17. Etiquette and discipline to be maintained in blood bank- 18. Reporting Formats and statistics	

Practical Session:

- Demonstration of licensing procedure for blood centers, calculation of various formulas used in blood banking

Books

1. Modern Blood Banking and Transfusion practices by Denise M Harmening, 5th edition
2. Transfusion Medicine technical manual-DGHS, Ministry of Health and Family Welfare, Govt. of India, Second edition, 2003
3. Blood transfusion in clinical medicine by PL Mollison

3rd Semester

Foundation 7	BMLT (TMT)	General Pathology General Microbiology	
Pathology			**Lectures**
1	**General Pathology Adaptations, Cell Injury and Repair:** Hyperplasia, atrophy, metaplasia, necrosis and apoptosis - Differences between apoptosis and necrosis.		2
2	**Acute and Chronic inflammation:** Five cardinal signs of inflammation- Outcomes of Acute inflammation Chronic inflammation Granulomatous inflammation Acute phase proteins		2
3	**Tissue repair, regeneration and hemodynamic disorders:** Cutaneous wound healing Pathologic aspects of repair-Hyperaemia and congestion-Thrombosis and Virchow triad Embolism-Infarction-Shock ; Bronchial asthma, COPD - Tumors		2
4	**Diseases of immune system:** Hypersensitivity reaction-Type I, II, III, and IV hypersensitivity reactions		2
5	**Neoplasia:** Definition of neoplasia. Differences between benign and malignant tumors Metastasis Carcinogenesis – Causes Carcinoma of oral cavity – Causes Etiology of Carcinoma cervix – type of virus implicated, high risk sero-types, Screening investigations Breast carcinoma – Risk factors		2
	Systemic Pathology		
6	**RBC and Bleeding disorders:** Anaemia – Definition and classification, Haemolytic anaemia, Iron deficiency anemia, Thrombocytopenia, Coagulation disorders – Terminology, Uses of Bleeding Time, PT and a PTT		2
7	**WBC disorders:** Leukocytosis, Leukemia – acute and chronic, Causes of splenomegaly		2
8	**Disease of the GIT:** Causes of Peptic ulcer Carcinoma stomach Intestinal obstruction, acute appendicitis Colonic carcinoma		2
9	**Diseases of Liver, Biliary tract and Pancreas:**		2

	Jaundice – classification based on pathophysiology Cirrhosis – Definition and causes Hepatitis – Types of viral hepatitis and transmission Portal hypertension – Symptoms Hepatic failure	
10	**Endocrine System:** Diagnostic criteria of diabetes mellitus, Major subtypes of diabetes mellitus, Differences between type I and Type II diabetes mellitus, Complications of diabetes mellitus	2
11	**Blood vessels:** Atherosclerosis Risk factors; American Heart association classification (1995) of Human atherosclerosis Hypertension – diagnostic criterion, types and causes Varicose veins Thrombophlebitis and Phlebothrombosis	2
12	**The Heart:** Heart failure congenital heart diseases causing left to right shunt and vice versa Myocardial infarction – causes, laboratory changes and complications Cor-pulmonale Rheumatic fever	2
13	**Diseases of the Lung:** Chronic obstructive pulmonary disease; Asthma – pathogenesis Pneumonia – lobar and bronchopneumonia Lung carcinoma – Incidence and Causes	2
14	**The Kidney and Lower urinary tract:** Acute Renal failure – definition and causes of Prerenal, renal and post-renal ARF Chronic renal failure – definition and causes Acute nephritic syndrome – definition and causes Nephrotic syndrome – definition and causes; Acute tubular necrosis – definition and causes Urolithiasis – types of stones	2
15	**Female genital tract:** Endometriosis – Definition Adenomyosis – Definition Leiomyoma **Male genital tract:** Carcinoma penis – causes Testicular tumors – Classification terminology Prostatic Hyperplasia – Causes, symptoms and PSA screening	2
16	**Nervous system:** Intracerebral, Subarachnoid and Subdural haemorrhage Meningitis and Encephalitis – Bacterial and viral causes and CSF findings; Epilepsy – Causes; Acute brain failure – Coma; Epilepsy – Classification terminology; CNS tumors – Classification terminology	2

Practical Sessions: Demonstration of various pathological condition by showing specimen and slides. Demonstration of blood slides		
Books: 1. Text book on Pathology for DMLT & Paramedical Courses, Dr. I Clement 2. Textbook of Pathology for Allied Health Sciences, Ramadas Naya 3. Eisenberg R.L. and Johnson N.M. (2012), *Comprehensive Radiographic Pathology* (5th edition), Mosby, ISBN 978-0-323-07847-4		
Course Title	**Microbiology:**	
1	Introduction and morphology - Introduction of microbiology, Classification of microorganisms, size, shape and structure of bacteria. Use of microscope in the study of bacteria	8
2	Growth and nutrition -nutrition, culture media, types of medium with example and uses of culture media in diagnostic bacteriology, antimicrobial sensitivity test	7
3	Sterilization and disinfection - principles and use of equipments of sterilization namely hot air oven, autoclave and serum inspissator, pasteurization, anti-septic and disinfectants.	7
4	Introduction to immunology, bacteriology, parasitology, mycology	8
Practical sessions: Demonstration of various micro-organism by showing specimen, culture media and slides. Demonstration of various sterilization equipments.		
Books: 1. Practical Medical Microbiology by Mackie and McCartney 2. Text book of Microbiology by Ananthanarayan 3. Medical Microbiology by Panikar& Satish Gupte 4. Text book of Microbiology by Prescott		

Core 6	**BMLT (TMT)**	**Blood donation and donor management**
Course Objectives		
Student should be able to understand donor selection, phlebotomy, blood donor retention and assist in management of donor reactions		
Detailed Syllabus		**Lectures**
1. Donor Motivation, Motivational Techniques, Social awareness, Preparation of IEC Materials. Blood donation Motivating factors for donation 2. Types of blood donors, Donor selection, 3. Donor questionnaire and interview: Eligibility and deferral criteria, medical interview and medical examination 4. Pre donation Investigations -haemoglobin estimation & Blood grouping 5. Equipment & Reagents used in screening, investigations. 6. Managing rejected blood donors, technique for conversion of first time donor into regular voluntary donor, donor felicitation. 7. Donor recruitment & Retention. 8. Pre donation & Post donation donor counselling.		3 per week

9. Medico-legal Aspects, NACO & DGHS guidelines.
10. Right to information, Donor Consent, reports, Leave letters, certificates
11. Blood collection room equipment, their principles, and use, emergency medicines,
12. Pre donation counselling, Solutions & Method for Preparing Phlebotomy Site, Test Tube Samples– Method of accurately relating product to donor bleeding of the donor, post donation care.
13. Mandatory emergency medicines to be made available and their uses. Donor reactions and their management.
14. Screening of blood units for mandatory tests, discarding infected units, post donation counselling.
15. 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.
16. Different types of Blood Collection – Autologous blood donation, Therapeutic Phlebotomy Preservation of donated blood, blood preservation solutions, Additive solutions.
17. Blood salvaging.

Practical Sessions

- Preparation of phlebotomy site.
- Operation of blood collection monitor, tube sealer and needle burner.
- Donor Room Protocol, Donor Screening Qualifying Test For Blood Donation- Laboratory investigations
- Donor Suitability / Selection
- Selection Of Bags for Collection Of Blood
- Blood Collection – Solutions & method For Preparing Phlebotomy Site

TEXT BOOKS

1. Medical laboratory Procedure Manual (T-M) by K.L. Mukherjee 1987, Vol.I, II & III Tata McGraw Hill Publication.
2. Modern Blood Banking and Transfusion practices by Denise M Harmening, 5th edition.
3. Transfusion Medicine technical manual-DGHS, Ministry of Health and FamilyWelfare, Govt. of India, Second edition, 2003
4. Blood transfusion in clinical medicine by PL Mollison
5. AABB Technical Manual, 17th ed, AABB

Core 7	BMLT (TMT)	Basic Immunohematology
Objectives:		
The student should be able to understand principles of various Immunohematology tests including		

instrumentation. Also, student should be able to document and report the test results.		
Detailed Syllabus		**Lectures**
	1. Introduction to Immunology, History, Immunity, Cells of immune system: Phagocytic cells, Antigen presenting cells, T cells, T cell subsets, B cells, CD Markers. 2. Antigens: Immunogen, allo-antigen, soluble antigen, Red cell antigen, Epitopes immunoglobulins, characteristics of immunoglobulins, Complement System, HLA system. 3. Antibodies: Polyclonal anti bodies, development of antibodies, structure of Monoclonal antibodies: Hybridoma technology, Human monoclonal antibodies. 4. Antigen antibody reaction: Antigen concentration, antibody concentration, enhancing media, other factors influencing antigen antibody reaction. 5. Basic Principles of immunohematology, application of blood groups, population Genetics. 6. Application of Blood groups: -Population Genetics, Forensic medicine, Transfusion medicine. ABO Blood of Group Systems: History, Genetics, ABH antigens, Biochemical Synthesis of blood group antigens, Antigenic sites, weaker variants, Bombay Phenotype, ABO antibodies. 7. Red cell serology techniques, their advantages and disadvantages, Cell and serum grouping, detection of weak A and B antigens, Trouble shooting in red cell serology 8. 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. 9. Other Blood Group Systems: Lewis, P, Ii, MNSs, Kell, Duffy, Celano, In, Private antigens, Public antigens 10. Principles of Direct and indirect antiglobulin test technique, Weak Rh D Typing. 11. Antenatal Serology, Hemolytic disease of the new born due to ABO Incompatibility, Rh Incompatibility and other allo-antibodies 12. Pre transfusion testing - Patient specimen labelling requirements, Patient / component identification requirements. 13. Different methods of cross matching, Saline Cross match, Saline replacement for rouleaux, enzyme technique, albumins technique, anti-globulin cross-matching. 14. Cross matching in special circumstances, emergency cross matching, electronic cross matching. Abbreviation of compatibility testing in emergency. Micro plate techniques	3 per week

Practical:

- Determination of ABO & Rh Blood Group (Reverse & Forward)–Tube method & CAT method
- Preparation of 3-5% Red Cell Suspensions
- Antiglobulin test – Direct and Indirect
- Antibody screening & identification
- Pre- transfusion testing (Cross matching)

• Quality control of anti-sera • Reading, Grading and Recording Results • Anti A and anti B titer estimation • Weak D testing
Books:
1. Medical laboratory Procedure Manual (T-M) by K.L. Mukherjee 1987, Vol.I, II & III Tata McGraw Hill Publication. 2. Modern Blood Banking and Transfusion practices by Denise M Harmening, 5th edition 3. Transfusion Medicine technical manual-DGHS, Ministry of Health and FamilyWelfare, Govt. of India, Second edition, 2003 4. Blood transfusion in clinical medicine by PL Mollison 5. AABB Technical Manual, 17th ed, AABB

Foundation 8	**BMLT (TMT)**	**Research Methodology & Biostatistics Part 1**
Course Title	**Research Methodology and Biostatistics**	
Course Objectives		
The objective of this module is to help the students understand the basic principles of research and methods applied to draw inferences from the research findings		
	Detailed Syllabus	**Lectures**
Section I		
1.	Introduction to research methods	6
2.	Identifying research problem	4
3.	Ethical issues in research	2
4.	Research design	6
Section II		
5.	Basic Concepts of Biostatistics	4
6.	Types of Data	4
7.	Research tools and Data collection methods	4
8.	Sampling methods	4
9.	Developing a research proposal	6
Practical: Students will be given problem and data to solve during practical sessions.		
Text Books		
1.Mahajan's Methods In Biostatistics For Medical Students And Research Workers, by Bratati Banerjee (Editor). Publisher : Jaypee Brothers Medical Publishers; 9th edition (2018)		

4th Semester

Foundation 9	BMLT (TMT)	Research Methodology part 2	
The objective of this module is to help the students understand how to conduct research in medical field.			
	Detailed Syllabus		**Lectures**
Section I			
1.	**Accessing research literature:** Use of databases and other sources		**5**
2.	**Understanding research design:** Qualitative and quantitative methodologies Their differences and potential integration Evaluating research and its potential for informing practice Developing research questions and devising methods for their investigation Ethical issues in research		**10**
Section II			
3.	**Analysis:** Analysis of qualitative and quantitative data Utilization of appropriate software to assist in the retrieval of information and data analysis		**10**
4.	**Clinical audit:** Distinctiveness of research and audit processes and their function		**5**
5.	**Research Skills and Management:** The role of evidence based practice within health and welfare		**4**
Books:			
1. Research for physiotherapist- Carolin Hicks 2. Mahajan's Methods In Biostatistics For Medical Students And Research Workers, by Bratati Banerjee (Editor). Publisher : Jaypee Brothers Medical Publishers; 9th edition (2018)			

Core 8	BMLT (TMT) TRANSFUSION TRANSMITTED INFECTIONS	
Course Objectives Student should be able to understand the principles of mandatory infections screening, its instrumentation, quality control and documentation of test results		
Detailed Syllabus		**Lectures**
	1. Study of major transfusion transmitted infection caused by viruses, Pathology, epidemiology Hepatitis B, Hepatitis C , Human immunodeficiency viruses 1 and 2, HTLV viruses I and II, and West Nile virus (WNV).Implication of the other viral diseases for blood transfusions: Epstein-Barr virus, cytomegalovirus (CMV), parvovirus B19 and Creutzfeldt-Jakob disease . 2. Transfusion associated parasites – Malaria & others. Syphilis and other pathogens. Malaria and syphilis by various methods and understand principles of testing. Understand and be able to interpret non treponemal and treponemal antibody tests used to diagnose syphilis. Transfusion	**4 per week**

	associated infections with other bacterial / fungal / protozoal infections. 3. Basic principles of ELISA test, various types of ELISA, Laboratory screening tests for TTI, Spot tests, Limitation of various tests. 4. Quarantine and recipient tracing, procedures for look-back and recipient follow-up. 5. Compare & contrast various methodologies such as ELISA, rapid & chemiluminescence used in screening of transfusion transmitted infections. National policy on TTI testing of blood donors. 6. Chemiluminence, NAT, Western Blot, Automation in blood donor TTI screening. Confirmatory tests for TTI testing. 7. Demonstrate proficiency in the preparation and use of internal control in transfusion transmitted infection screening. 8. Quality control and documentation. Proficiency testing – IQUAS & EQUAS Pathogen reduction, Cellular components and plasma components. 9. Discard of Blood Parts and Documentation of records, Universal precautions –Bio waste management. 10. Disposal of Reactive Bags, its components. Demonstrate proficiency in proper disposal of bio hazardous material as per recommended standards.	

Practical:

- ELISA for HBsAg, HIV, HCV & Syphilis detection.
- Rapid tests for HIV, HCV, HBsAg, Malaria and Syphilis detection.
- RPR test for Syphilis.
- Biomedical waste management exercises

Books

1. Medical laboratory Procedure Manual (T-M) by K.L. Mukherjee 1987, Vol.I, II & III Tata McGraw Hill Publication.
2. Modern Blood Banking and Transfusion practices by Denise M Harmening, 5th edition
3. Transfusion Medicine technical manual-DGHS, Ministry of Health and FamilyWelfare, Govt. of India, Second edition, 2003
4. Blood transfusion in clinical medicine by PL Mollison
5. AABB Technical Manual, 17th ed, AABB

Core 9	BMLT (TMT)	BLOOD COMPONENT PREPARATION, STORAGE AND QUALITY CONTROL

Course Objectives

Student should be able to understand the principles of blood component separation, its instrumentation, storage and quality control testing as per Drugs and Cosmetics Act of India

	Detailed Syllabus	Lectures
1	1. Basic steps in component preparation & labelling. 2. Composition & storage Composition: volume, cellular, plasma and clotting factor content. 3. Equipment used for component preparation.	5 per week

	4. Selection of blood bags for component preparation. 5. Care and precautions to be taken during whole blood collection and before component preparation. 6. Programming for component preparation, PRP & Buffy coat methods & Other methods of component preparation. 7. Preparation of red cell concentrate, Fresh Frozen plasma, other plasma products platelet concentrate, cryoprecipitate, washed red cells. 8. Plasma Fractionation: Principles, manufacturing of different plasma derivatives. 9. Storage conditions for components "Storage lesions"- Metabolic changes in blood components during storage, release of cytokine during storage. 10. Component Testing, Labelling, Transportation and storage of blood components. 11. Inventory management and maintenance of blood stock 12. Modified blood components: Preparation of leukoreduced blood products, Leukocyte filters, Irradiated blood components, Blood substitutes, Washed /plasma reduced blood components, frozen red cells. 13. Specialized blood components –CMV free and HLA matched & Blood substitutes, Recombinant clotting & hematopoietic growth factors. 14. Quality control of components: Measurement of factor VIII level in FFP, Measurement of fibrinogen level in FFP, Measurement of pH and other platelet parameters, Sterility test on platelet concentrates, Sterility test on whole blood and Packed red blood cell concentrate. 15. Plasma fractionation products & Pathogen inactivation methods. 16. Management of Blood Bank Issue Counter, Criteria for acceptance of requisition form.	

Practical Sessions

- Refrigerated centrifuge operation, various programs for preparing of blood components
- Preparation of packed red cells, FFP, Cryoprecipitate, RDP
- Operation of Laminar Flow
- Leukodepletion of red cells / platelets
- Learning blood component separation-Buffy Coat Method
- Quality control of Components

Books:

1. Medical laboratory Procedure Manual (T-M) by K.L. Mukherjee 1987, Vol.I, II & III Tata McGraw Hill Publication.
2. Modern Blood Banking and Transfusion practices by Denise M Harmening, 5th edition
3. Transfusion Medicine technical manual-DGHS, Ministry of Health and FamilyWelfare, Govt. of India, Second edition, 2003
4. Blood transfusion in clinical medicine by PL Mollison
5. AABB Technical Manual, 17th ed, AABB

5th Semester

Core 10	BMLT (TMT)	HEMOTHERAPY

Course objective

The aim of this course is to make the student aware of rational use of blood and components, various indications and contraindications, their clinical outcome after transfusion and monitoring adverse effects.

Detailed syllabus		Lectures
	1. Inspection and selection of blood component. 2. Plan for transfusion. Criteria for issue of blood and blood Components. 3. Use red cell components in of different types of anemia, Use of blood components in bleeding patient, Neonatal transfusion, and Transfusion practices in surgery, Selection of units for cross matching, 4. Transfusion therapy for oncology and Trans plantation patients. 5. Transfusion indications: Red blood cells, Platelets, Plasma / cryoprecipitate, Granulocytes. 6. Pre Transfusion strategies in special cases regarding samples, techniques and protocols in special patients circumstances -Paediatric / neonatal, Obstetric including intra uterine, cardiac surgery, burn patients & trauma patients. 7. Blood administration, transfusion filters, post transfusion care, maximal surgical blood order schedule. 8. Immune haemolytic anaemia, warm & cold type, drug induced haemolytic anaemia. 9. Thrombocytopenia Immune thrombocytopenic purpura. Thrombotic thrombocytopenic purpura. Post transfusion purpura. 10. Foetal and neonatal thrombocytopenia. 11. Granulocyte transfusion. 12. Platelet refractoriness Recognition and evaluation. 13. Calculation of CCI and platelet recovery 14. Transfusion reactions Diagnosis, Pathophysiology, Investigations. 15. Hemolytic transfusion reaction - immediate and delayed; immune and non-immune reaction path physiology; Clinical signs and symptoms and laboratory investigation for HTR, Transfusion reaction work up. 16. Non- hemolytic transfusion reactions Immediate and delayed, bacterial contamination, febrile reaction, Allergic reaction, Transfusion related lung injury, PTP, Alloimmunization, Iron overload, Graft versus host disease. 17. Current risk & Prevention strategies of transfusion reactions and rational use of blood components	6 per week
Practical session		

- Workup of transfusion reactions
- Demonstration of HIS for blood requestion etc

Books:

1. Standards for blood banks and blood transfusion services, NACO, Ministry of Health and Family Welfare, Govt. of India, New Delhi 2007
2. Medical laboratory Procedure Manual (T-M) by K.L. Mukherjee 1987, Vol.I, II & III Tata McGraw Hill Publication.
3. Modern Blood Banking and Transfusion practices by Denise M Harmening, 5th edition
4. Transfusion Medicine technical manual-DGHS, Ministry of Health and FamilyWelfare, Govt. of India, Second edition, 2003
5. Blood transfusion in clinical medicine by PL Mollison
6. AABB Technical Manual, 17th ed, AABB

Core 11	**BMLT (TMT)BLOOD BANK EQUIPMENT, DOCUMENTATION AND QUALITY CONTROL**	
Objective:		
The aim of this course is to make the student aware of various national guidelines regarding blood transfusion services in India such as Drugs and Cosmetics Act, National Blood Policy, documentation and record keeping. Student should be able to understand principles of quality management in blood transfusion services		
Detailed Syllabus		**Lectures**
	1. General Lab equipment 2. Colorimeters & Elisa readers, washers 3. Thermometers 4. Weighing devices 5. Refrigerators 6. Platelet agitators & Incubators 7. Deep freezers 8. Thawing bath & devices 9. Plasma expressers 10. Sterile connecting devices 11. Apheresis equipments 12. Computers 13. Software & Hardware 14. Temperature regulating devices (Incubators, Hot air oven) 15. Autoclaves 16. Cell washers 17. HIS 18. Automation platforms 19. Blood serology: Various reagents & Kits ordering, specifications & Documentation 20. TTI Kits- Ordering, specifications and documentation 21. Quality control, assurance and management systems. 22. Quality control of empty blood bags. Quality control of different blood bank Components, sterility test on component. 23. Quality control of blood bags, Quality Assurance Hb &PCV, Quality control of blood grouping reagents, QC of anti-human globulin reagent,	3 per week

	bovine albumin, Normal saline, Antisera etc., QC of TTI test kits – ELISA, CLIA & Rapid 24. Quality control of all equipments, Calibration, validation and maintenance of blood bank equipment. 25. QC of blood bank techniques Quality Assurance - Temperature Records, Sterility Testing. Internal QC and External QC 26. Quality parameters of various blood components, Quality Assurance blood components – red cells, FFP, cryoprecipitate, platelets, Red Cell and WBC contamination. 27. Calibration, validation and maintenance of blood bank equipment, QC of blood bank technique. 28. Documents, Registers, Records & Formats to be kept. Licensing, Drug authorities' inspection and compliance. 29. Registers forms, Documentation and Standard operating procedures (SOP or GMP), Blood bank management system, Regulations for blood bank operation, Drugs and cosmetics Law, National blood policy, standards in Blood Banking, licensing procedures, ethical aspects of blood transfusion. 30. Hospital Transfusion Committee. Blood Bank Accreditation- . ISBT, NABL, NABH standards and accreditation. 31. Legal and ethical aspects, Regulatory Acts, Bio hazard Waste Disposal Act, National blood policy.	

Practical sessions:

- Demonstration of various methods of quality control, sterilization & maintenance of equipments.

Books:

1. Standards for blood banks and blood transfusion services, NACO, Ministry of Health and Family Welfare, Govt. of India, New Delhi 2007
2. Medical laboratory Procedure Manual (T-M) by K.L. Mukherjee 1987, Vol.I, II & III Tata McGraw Hill Publication.
3. Modern Blood Banking and Transfusion practices by Denise M Harmening, 5th edition
4. Transfusion Medicine technical manual-DGHS, Ministry of Health and FamilyWelfare, Govt. of India, Second edition, 2003
5. Blood transfusion in clinical medicine by PL Mollison
6. AABB Technical Manual, 17th ed, AABB

6th Semester

Core 12	BMLT (TMT)	APHERESIS

Course Objectives:
The student should be able to understand the principles of cell separation using automated apheresis equipment. Should be able to load the consumables on the cell separator and monitor the procedure.

Detailed Syllabus		Lectures
	1. Principles of Apheresis procedures, Apheresis products, 2. Apheresis donor selection – investigations, physical 3. Loading of consumables 4. Principles of separation of components by apheresis 5. Quality control of apheresis products 6. Maintenance of cell separator equipment. 7. Preparation of multiple products on cell separators- a. Plateletpheresis, b. Plasmapheresis (Single donor & TPE), c. Leukapheresis (Granulocyte & Peripheral hematopoietic blood stem) 8. Rationale of therapeutic plasma exchange 9. Indications of plasma exchange	6 per week

Practical sessions:

- **Demonstration of various apheresis procedures and post donation care**

Books:

1. Medical laboratory Procedure Manual (T-M) by K.L. Mukherjee 1987, Vol.I, II & III Tata McGraw Hill Publication.
2. Modern Blood Banking and Transfusion practices by Denise M.Harmening, 5th edition
3. Transfusion Medicine technical manual-DGHS, Ministry of Health and FamilyWelfare, Govt. of India, Second edition, 2003
4. Blood transfusion in clinical medicine by PL Mollison
5. AABB Technical Manual, 17th ed, AABB

Core 13	BMLT (TMT)	RECENT ADVANCES

Objectives
The aim of this course is to make the student understand various advances taking in the field of Transfusion Medicine all over the world.

Detailed Syllabus	Lectures

1.	1. Latest trends in blood banking- a. Donor screening, retention, b. Blood collections, components etc. c. Recent advances in Automation of Blood Banking. 2. Nucleic Acid Testing. 3. Stem Cells & Cord stem cell banking. 4. Stem cell- a. Cord blood, b. Peripheral blood Haematopoietic stem cell and c. Stem cell banking and application. 5. Procedures of collection of stem cell and calculation of stem cell collected. 6. Quality control of stem cells products. 7. Cryopreservation, maintenance, QC and thawing procedures in stem cell banking. 8. Immunotherapy 9. Mesenchymal stem cells 10. Universal red cells 11. Regenerative medicine.	6 per week
Practical session: • Demonstration of nucleic acid testing, collection and cryopreservation of stem cells		
Books: 1. Medical laboratory Procedure Manual (T-M) by K.L. Mukherjee 1987, Vol.I, II & III Tata McGraw Hill Publication. 2. Modern Blood Banking and Transfusion practices by Denise M Harmening, 5th edition 3. Transfusion Medicine technical manual-DGHS, Ministry of Health and FamilyWelfare, Govt. of India, Second edition, 2003 4. Blood transfusion in clinical medicine by PL Mollison 5. AABB Technical Manual, 17th ed, AABB		

ANNEXURE – III

List of external experts / examiners for B.Sc. in Transfusion Medicine Technology

SN	Name	Email	Mobile No
1	Dr Archana Solanki, MD Addl Prof, Dept of Transfusion Medicine, KGMU, Lucknow	archana.solanki@gmail.com	8979438922
2	Dr Ashutosh Singh, MD Addl Prof, Dept of Transfusion Medicine, KGMU, Lucknow	drashullrm@gmail.com	9412836605
3	Dr Ashish Jain, MD Asstt Prof, Dept of Transfusion Medicine, AIIMS, Rishikesh	ashish.jain.modi@gmail.com	9917817515
4.	Dr Hem Chandra Pandey, MD Assoc Prof, Dept of Transfusion Medicine, AIIMS, New Delhi	pandeyhemc@gmail.com	9532993308
5.	Dr Rahul Chaurasia, MD Assoc Prof, Dept of Transfusion Medicine, AIIMS, New Delhi	drrahulchaurasia@gmail.com	9560345917
6.	Dr. Dnyaneshwar Patale, MD Asstt Prof, Dept of Transfusion Medicine, AIIMS, Raibareli	dnyaneshwar.patale@gmail.com	8850112287
7.	Dr Saurabh Murti, MD Asstt Prof, Dept of Transfusion Medicine, AIIMS, Gorakhpur	drsaurabhmurti@hotmail.com	6392418566
8.	Dr Shashank Ojha, MD Transfusion Medicine ATRECT, Kharghar, Navi Mumbai, Maharashtra 410210	ojhashashank3@gmail.com	8655989152
9	Dr Somnath Mukherejee, MD Addl Prof, Dept of Transfusion Medicine, AIIMS, Bhubaneswar	somfusion@yahoo.co.in	9438884262
10	Dr Archana Bajpai, MD Addl Prof, Dept of Transfusion Medicine, AIIMS, Jodhpur	drarchanabajpai@yahoo.co.in	8003996943