STATE PARAMEDICAL SCIENCE FACULTY

Diploma in Medical Laboratory Technology (DMLT)

Year I

Objectives of the Course		
Diseases can be prevented and cured through proper analysis of the body symptoms such as body fluids. This course teaches the student various procedures of the lab and its proper reporting ethically, confidently, safely. They will also keep abreast of the research trends.		
Paper I : Anatomy, Physiology		
Sr. No.	**Topics**	**Hrs.**
1.	**Terminology used in Anatomy, Bones – Names and location. Basic orientation and organization of human body from cell to organ system**	**06**
2.	**Human cells and tissues – Muscle, blood, gland, bone, nerve, reproductive cells and tissues – Organization and their functions**	**15**
3.	**Directional references of human body**	**02**
4.	**Body cavities – Dorsal and ventral**	**02**
5.	**Skeletal System – Terminology, position, basic details. Joints – Terminology, types, structure**	**20**
6.	**Integumentary System – Terminology, basics**	**02**
7.	**Gastrointestinal System – Terminology, position, structure, parts and their functions.** **Digestive process, absorption and defaecation.**	**10**
8.	**Respiratory System – Terminology, position, structure, parts and their functions, breathing mechanism.**	**10**
9.	**Urinary System – Terminology, position, structure, parts and their functions, process of urine formation and voiding.**	**10**
10.	**Male Reproductive System – Terminology, position, structure, parts and their functions**	**05**

11.	**Female Reproductive System – Terminology, position, structure, parts and their functions,**	**05**

	menstrual cycle.	
12.	**Endocrine System – Terminology, position, structure, function and regulation of all hormones**	**10**
13.	**Brain and Spinal Cord – Terminology, structure, functions**	**05**
14.	**Blood – Terminology, composition, lymphatic details and clotting system.**	**05**
15.	**Sensory organs (eyes, ears, nose and tongue) – Terminology, functions.**	**10**
16.	**Cardiovascular System – Terminology, structure. Vessels entering and leaving the heart. Arterial and venous tree.**	**10**
17.	**Lymphatic System – Terminology, functions of WBCs, spleen, tonsils and lymph nodes**	**05**
18.	**Immune System – Terminology, components, mechanism of defense**	**05**

Reference Books

1.	**An Integrated Approach to Health Sciences**	**Colbert Bruce, Jeff Ankney, Joe Wilson, John Havrilla**	**Cengage Learning**
2.	**Human Physiology, Biochemistry and Basic Medicine**	**Laurence A. Cole, Peter R. Kramer**	**Elsevier**
3.	**Introduction to Human Anatomy and Physiology**	**Solomon. E.A.**	**Saunders: St Louis**

Paper II : Microbiology

Sr. No.	Topics	Hrs.
1.	**Introduction to Microbiology – Definition, history, classification and importance.**	**01**
2.	**Introduction to Bacteria – Structure, shape, anatomy, structure of cell wall, classification and nutrition of bacteria**	**03**
3.	**Bacterial Culture Media – Classification, composition, methods, growth curve**	**05**
4.	**Staining of Bacteria – Terminology, classification, special staining (Metachromatic granules, spores capsules, spirochetes and flagella)**	**05**
5.	**Sterilization and disinfection – Introduction to sterilization, disinfection, antiseptic, bacteriocidalagents, bacteriostatic agents, methods of sterilization (physical, chemical, dry**	**20**

	heat,moist heat), filtration, radiation, autoclave, types of autoclave, commonly employed sterilizationmethod for different clinical article, uses of disinfectant	
6.	**Infection - Classification of infection,source of infection in man, method of transmission of infection**	**10**
7.	**Morphology and Pathogenicity of –** **a) Gram positive cocci-Staphylococci, Streptococci,** **b) Gram negative cocci- Neisseria** **c) Gram positive bacilli- Corynebacterium, Actinomy, Listeria, Bacillus, Clostridia, Mycobacterium tuberculosis and Mycobacterium leprae.** **d) Gram negative bacilli- Pseudomonas, Vibrio, Aerononas, Plesiomonas, Brucella, Haemophillus, Bordetella, Chlamydia, Spirochaetes, Rickettsia, Mycoplasm Salmonella, Shigella,Vibrio**	**10**

Reference Books

1.	**Text Book of Microbiology**	**Chakraborty**	**New Central Book Agency P Ltd**
2.	**Microbiology - An Introduction**	**by Tortora Funk**	**Pearson**

Paper III : Biochemistry

Sr. No.	Topics	Hrs.
1.	**Basics of Biochemistry –Terminology, introduction, units of measurement**	**05**
2.	**Basics of Biochemistry – Bioenergetics, thermodynamics**	**05**
3.	**Amino acids – Essential and non-essential with structure and function.**	**05**
4.	**Proteins – Structure (primary, secondary, tertiary, quaternary), functions, digestion and absorption of proteins (urea cycle and ammonia excretion).**	**08**
5.	**Lipids –Role, classification, digestion and absorption of lipids**	**05**
6.	**Fatty Acids – Essential and nonessential fatty acids and their role.**	**03**
7.	**Enzymes–Classification, coenzyme, enzyme action and various factors effecting, significance of enzymes**	**05**
8.	**Carbohydrates–Definition, sources, classification, carbohydrate metabolism (glycolysis- Kreb's cycle,**	**10**

	glycogenesis, glycogenolysis, gluconeogenesis), insulin and glucagon, intolerance of lactose.	
9.	**Vitamins–Classification (water and fat soluble with deficiency effects)**	**05**
10.	**Mineral – Major And Minor Minerals In Human Body (calcium, phosphorus, magnesium, iron, copper, zinc, fluoride, selenium, manganese)**	**08**
11.	**Harmone–Characteristics, various harmones and their functional importance.**	**10**

Reference Books

1.	**Text Book of Biochemistry**	**U Satyanarayana and Chakrapani**	**Elsevier**
2.	**Microbiology - An Introduction**	**by Tortora Funk**	**Pearson**

Paper IV : Pathology

Sr. No.	Topics	Hrs.
1.	**Introduction to Clinical Pathology – Terminology, branches, importance of each branch**	**03**
2.	**Haematology–Composition, formation and function of blood.**	**05**
3.	**Blood Collection–Collection and preservation of blood for investigation. Anticoagulants used in hematology**	**05**
4.	**Hematocrit –Methods of measurement, indices (PCV, MCV, MCH, MCHC)**	**05**
5.	**Anaemia – Meaning and its detailed classification**	**05**
6.	**Estimation of Haemoglobin–Structure of haemoglobin, estimation (Methods based on development of color, oxygen combining capacity and iron content)**	**10**
7.	**Morphology of blood cells and their identification.**	**08**
8.	**Erythrocyte Sedimentation Rate (ESR)–Methods of measurement, factors effecting, significance of measurement**	**08**
9.	**Urine Analysis –Collection and preservation, physical, chemical and microscopic examination.**	**05**
10.	**Stool Analysis –Macroscopic, microscopic and chemical examination**	**05**
11.	**CSF Examination –Cell count (Leucocyte, differential count), biochemical examination of CSF**	**05**
12.	**Semen Analysis –Collection of sample, physical**	**05**

	properties, motility of spermatozon, morphological examination of spermatozon	
13.	**Blood Banking –Techniques of blood collection, anticoagulants used in hematology, common aspects of immunohematology, 3 antigen antibody reactions, ABO blood group system**	**20**
14.	**Rhesus Blood Group System–Antigens, significance of Rh typing, slide technique**	**05**
15.	**Blood Transfusion –Pre-transfusion (compatibility testing), instructions, registration of donors, transfusion reactions, blood component transfusion**	**20**
16.	**Histopathology –Introduction with terminology, grossing meaning, ways and importance, lab safety and hazards**	**10**
17.	**Fixation – Aim, principles, types**	**05**
18.	**Decalcification – Importance and methods**	**05**
19.	**Tissue Processing–Meaning, importance and methods**	**05**
20.	**Hematoxylin– Properties (progressive and regressive), preparation methods. Eosin – Methods of staining, staining methods to demonstrate special/ specific tissues**	**10**
21.	**Cytology – Terminology, importance and introduction to fields of study.**	**05**

Reference Books

1.	**Robbins and Kumar Basic Pathology: First South Asia Edition**	**Kumar and Abbas**	**Elsevier**
2.	**Textbook of Pathology with Pathology Quick Review and MCQs**	**Harsh Mohan**	**Jaypee**
3.	**Textbook of Medical Laboratory Technology**	**RamnikSood**	**Jaypee**

Lab –Anatomy & Physiology

1.	**Study of the human skeleton**
2.	**Study with the help of charts and models of digestive system, respiratory system, ear, cardiovascular system, reproductive system, eye and urinary system**
3.	**Microscopic examination of epithelial tissue, cardiac muscle, smooth muscle, skeletal muscle. Connective tissue and nervous tissues**
4.	**Examination of blood films for TLC.DLC and malarial parasite**
5.	**Determination of RBCs, clotting time of blood, erythrocyte sedimentation rate and Hemoglobin**

	Value
6.	**Recording of body temperature, pulse, heart-rate, blood pressure and ECG**
Note – The study of physiology and anatomy should be coordinated so that the structure and functions can be explained and understood clearly.	

Lab – Microbiology	
1.	**Demonstration of a bacterial cell by simple staining.**
2.	**Demonstration of cell wall by slide.**
3.	**Demonstration of a eukaryotic cell by slide.**
4.	**Demonstration of a bacterial spore.**
5.	**Demonstration of flagella.**
6.	**Demonstration of inclusions bodies.**

Lab – Biochemistry	
1.	**Detection of protein from blood, urine etc.**
2.	**Detection of carbohydrates from blood, urine & other body fluid.**
3.	**Detection of amylase enzyme activity from saliva.**
4.	**Qualitative and quantitative tests for determination of carbohydrate.**
5.	**Qualitative tests for determination of protein.**
6.	**Qualitative tests for determination of fats.**
7.	**Enzyme assay for analysis of enzymes.**
8.	**Estimation of different serum enzymes like- AST, ALP, alkaline Phosphatase, acid Phosphatase, amylase, lipase.**

Lab – Pathology	
9.	**ABO blood grouping**
10.	**Rh Typing**
11.	**Coomb's test**
12.	**Blood, preservation and storage, recording the details and storage of blood**
13.	**Analysis of urine for routine and others tests**
14.	**Faeces occult blood test**
15.	**Total RBC Count**

16.	**Total and differential Leucocyte Count**
17.	**Total platelet count**
18.	**ESR**
19.	**Semen analysis**

STATE PARAMEDICAL FACULTY

Diploma in Medical Laboratory Technology (DMLT)

Year II

Objectives of the Course		
Diseases can be prevented and cured through proper analysis of the body symptoms such as body fluids. This course teaches the student various procedures of the lab and its proper reporting ethically, confidently, safely. They will also keep abreast of the research trends.		
Paper II : Microbiology		
Sr. No.	**Topics**	**Hrs.**
1.	**Immunology– Introduction, definition, history, origin of cells, principle, functions.** **Organs involved in immune system (primary and secondary lymphoid organs), cells involved in immune responses (hematopoiesis, phagocytic cells and their killing mechanisms), defensemechanisms (innate immune system and adaptive immune system with properties and mechanism), nature of antigens and antibody, structure and functions of immunoglobulin's.** **Hypersensitivity – Meaning, classification and types of hypersensitivity reaction, immunodeficiency disorders, autoimmune diseases.** **Vaccines– Types of vaccines,immunological tolerance**	**30**
2.	**Serology – Introduction, techniques with principles, serological tests (WIDAL, VDRL, CRP, RF, ASO, Weil- Felix, pregnancy rapid card test).**	**10**
3.	**Bacteriology – Introduction, principles and methods in identifying an unknown organism, technique of specimen (pus, urine, stool, sputum, throat swab) examination.**	**05**
4.	**Infections –Introduction, microbes causing, factors causing emergence of infectious diseases** **Emerging and re-emerging infections – Definition, factors responsible, examples** **Defenses for infectious diseases – Common health measures, public health organizations**	**05**
5.	**Nosocomial Infection: Introduction, meaning, definition,**	**20**

	transmission, causes of epidemiology nosocomial infections, bacteriology surveillance.	
6.	**Systemic Bacteriology –Introduction, gram positive cocci (staphylococcus aureus), neiserria (corynebacterium, bacillus, clostridium), non-sporinganaerobes, mycobacterium tuberculosis, spirochates (mycoplasma).**	**20**
7.	**Virology – Introduction to virus (properties, structure, classification, life cycle, host virus interaction), morphology, pathogenesis, clinical syndromes, lab diagnosis of a few viruses (poliovirus, herpes virus, hepatitis B virus, HIV), structure and significance of bacteriophage.**	**20**
8.	**Mycology – Fungi (overview of fungal systematic and taxonomy, properties), parasitic fungi (moulds, yeasts, dimorphic mycotic agents)** **Classification of Fungal Diseases – Superficial mycoses, subcutaneous mycoses, systemic mycoses, laboratory diagnosis and prevention of fungal diseases.**	**20**

Lab - Microbiology

1.	**Widal Test..3.. 4.. 5.. 6.. 7.. 8.. 9.**
2.	**VDRL Test**
3.	**Determination of CRP**
4.	**ASO Test**
5.	**RA Test**
6.	**Pregnancy Rapid Card Test**
7.	**Rapid Detection of Hepatitis B Surface Antigen (HbsAg)**
8.	**Qualitative Determination of HIV 1/2 Antibody**
9.	**Examination of Sputum for TB.**

Reference Books

1.	**Really Essential Medical Immunology**	**Arthur Rabson, Iwan. M. Roit, Peter. J.**	**Wiley-Blackwell**

Paper I : Biochemistry			
Sr. No.	**Topics**		**Hrs.**
1.	**Introduction – Scope, importance.** **Cell – Organization, organic and inorganic components.Chemical composition of human, prokaryotic and eukaryotic cells with comparison between two.** **Ion Concentration and Buffers – pH, blood buffers, blood pH and its regulation, acid base metabolism, disorders of acid base balance.**		**08**
2.	**Water – Balance, functions, water intake (Exogenous and endogenous), water output, dehydration, distribution of fluids in the body, ECF & ICF.**		**05**
3.	**Electrolytes – Balance, electrolytic composition of body fluids, regulation of electrolyte balance, osmosis & application of osmosis.Mineral metabolism, macronutrients (principal mineral elements) & trace elements.Electrolyte analysis (calculation ofanion gap, use of anion gap, electrolyte critical values).**		**10**
4.	**Carbohydrates – Sources in diet, digestion, absorption, and metabolism.** **Blood glucose – Importance, regulation (homeostasis of blood glucose), glucosetolerance test, glucocylatedHb, other parameters and related disorders, diabetes.** **Insulin, effects of insulin on glucose utilization, hormonal regulation of blood glucose (insulin, glucagon, epinephrine, thyroxin, glucocorticoids, growth hormone, ACTH, hypoglycemia (post prandial hypoglycemia, fasting hypoglycemia), hyperglycemia.**		**10**
5.	**Renal Function – Basic functions, creatinine metabolism, various renal failure, nephrotic syndrome, renal control of acid- base balance,renal tubular acidosis,kidney stones**		**15**
6.	**Organ Profiles – Kidney function test; Thyroid function test; Cardiac function test; Pancreas function test; Hypertension profile; Diabetic profile; Gastric function test.**		**20**
7.	**Liver Functions – Tests for liver function, bilirubin metabolism;** **Hyperbilirubinemia,obstructive jaundice including neonatal jaundice,hepatitis, pathophysiology of liver enzymes, analytical aspects of liver enzymes.** **Disorders related to proteins and amino acids,**		**20**

	interpretation of total serum protein levels.	
8.	**Thyroid Disorders – Testing, EMIT (Enzyme-Multiplied Immunoassay Technique), old ways of thyroid testing; hyper and hypothyroidism.**	**15**
9.	**Therapeutic Drug Monitoring – Barbiturate phenobarbital, phenytoine, lithium, lead, salicylate, mercury, digitalist; buffer system importance of arterial blood gases.**	**15**
10.	**Radioactivity – Types of radioactive decay with examples, half-life, units, and applications of radioisotope in clinical chemistry.**	**10**
11.	**Detection of Drugs & Toxic Substances – Principles of chromatography; paper & thin layer chromatography, applications in detection of drugs & toxic substances.**	**20**
12.	**Cholesterol Estimation – Methods, principle, advantages and disadvantages of different methods.**	**10**
Lab - Biochemistry		
1.	**Blood urea estimation**	
2.	**Serum creatinine estimation**	
3.	**Serum uric acid estimation**	
4.	**Serum albumin estimation**	
5.	**Serum glucose estimation**	
6.	**Serum total protein estimation**	
7.	**HDL cholesterol (direct) estimation.**	
8.	**LDL cholesterol (direct) estimation**	
9.	**Serum globulin estimation**	
10.	**Total cholesterol estimation**	
11.	**Triglyceride estimation**	
12.	**Serum Bilirubin total estimation**	
13.	**Serum amylase estimation**	
14.	**Serum GOT (AST) estimation**	
15.	**Alkaline phostase estimation**	
16.	**Serum GPT (ALT) estimation**	
17.	**Acid phosphatase estimation**	
18.	**Serum sodium estimation**	
19.	**Serum chloride estimation**	
20.	**Serum potassium estimation**	
21.	**CK-NAC estimation**	

Reference Books			
1.	**Clinical Biochemistry: An Illustrated Colour Text**	**Allan Graw, Michael J. Murphy, Rajeev Srivastava, Robert A. Cowan, Denis St. J.**	**O'Reilly**
2.	**Clinical Biochemistry**	**Nanda Maheshwari**	

Paper III : Pathology		
Sr. No.	**Topics**	**Hrs.**
1.	**Introduction to Clinical Pathology – Importance, reception of patients (phlebotomy and aftercare of patients).** **Laboratory records, care of specimens, apparatus and equipment care. Cleaning of used and new glassware.** **Preparation of anticoagulants, reagents, buffers etc. and its uses.** **Testing level of significance, pathology, pathogenesis, disease diagnosis.**	**08**
2.	**Haematology– Composition, formation and function of blood.**	**05**
3.	**Blood Collection–Methods of collection of blood. capillary and arterial blood, blood buffers, serum, plasma (organic and inorganic components, plasma proteins),** **Haemoglobin – Definition, amino acid for buffering action of haemoglobin, porphyrin, types of haemoglobin, degradation of haeme to bile pigments. Characteristics and significance of multiple myeloma.**	**20**
4.	**Urine Analysis –Components (normal and abnormal constituents), nature. Hormones in urine formation, disease status, glycosuria – concept, transitory or persistent.**	**15**
5.	**Stool Analysis –Macroscopic, microscopic and chemical examination, containers involved**	**10**
6.	**CSF Examination –Indication, collection, container of body fluids, transport of sample, preservation.** **Fluid analysis – physical, chemical and microscopic examination and its significance.**	**10**
7.	**Semen Analysis –Collection of sample, physical properties, motility of spermatozon, morphological examination of spermatozoon, containers involved, transport and preservation.**	**10**
8.	**Blood Banking –ABO and Rh blood group system. Blood grouping, reverse grouping.** **Blood banking – Anticoagulants, cross matching, Screening test for incomplete antibodies (antiglobulin test, Coomb's test)** **Blood components – Preparation of blood components, requisition of blood, preparation of red cell suspension**	**20**

9.	**Blood Transfusion –Pre-transfusion (compatibility testing), instructions, registration of donors, transfusion reactions, blood component transfusion**	**20**
10.	**Histopathology –Human tissues and their histological structure (epithelial tissues, connective tissues, muscle, and nerves).** **Human Organs – Histological structure ofkidney, urinary bladder, heart, lungs, liver, stomach and skin;** **Biopsy specimens – Reception at laboratory, fixation of tissues, classification of fixing agents and mechanism of fixation, decalcification.** **Processing of tissues – Automated and manual tissue processing, paraffin embedding, and other techniques for embedding;** **Frozen section/cryostat – Use of Microtomes, selection and maintenance of knife, technique of section cutting and mounting on slide, staining of section slide.**	**30**
11.	**Cytology – Techniques, Cytopathology, fixation, pap staining, cytological processing of fluids,FNAC (Fine needle aspiration technology), Cytochemistry and immunohistochemistry**	**10**
Lab - Pathology		
1.	**Physical Examination of urine(colour, odour, reaction (pH), specific gravity), urine concentration test** **Estimation of urine for abnormal constituents (test for Albumin through sulfosalicylic, heat method and Heller's method)).** **Estimation of proteins in urine using Esbach'salbuminometer, calcium in urine** **Interpretation and indication ofdiseases (Glucosuria-Diabetes mellitus, Renal glycosuria, Pregnancy,alimentary glycosuria.**	
2.	**Qualitative test forDiacetic Acid (Gerhardt's test), Rothra's test, Heat test, Gerhardt's test.**	
3.	**Physical examination of CSF cell count (Sulphosalicylic test), Gross evaluation** **of CSF, Biochemical examination (sugar, protein, globulin – Pandy's test,** **Chloride).**	
4.	**Separation of Human Lymphocytes and preparation of Rosette formingcells from peripheral blood.**	

5.	**Identification of B and T–cells and Single Radial ImmunoDiffusion (SRID) Test (Mancini Technique)**		
Reference Books			
1.	**Guidelines for Good Clinical Laboratory Practices (GCLP)**	**Indian Council of Medical Research**	
2.	**Human Blood Groups**	**Daniels G.**	**Wiley**

Paper IV : Social and Preventive Medicine		
Sr. No.	**Topics**	**Hrs.**
1.	**Nutrition–Macro and micronutrients, trace elements, balanced diet, dietary goals and RDA, assessment of nutritional intake, nutritional deficiency, public health problem, food adulteration, protection and standards, public health acts related to food quality**	**10**
2.	**Medical Sociology – Behaviour, culture, role of family in health and disease, social security, psychology and social organizations**	**08**
3.	**Reproductive and Child Health – Introduction, to RCH, maternal health, new Born Care, child health, growth and development, indicators of maternal and child health care, school health programmes.** **Juvenile delinquency, child abuse, street children , refugee and displaced children, child labour, child trafficking, mission Indradhanush, global strategic measles and rubella plan**	**20**
4.	**Demographyand Related Indicators – Introduction, vital statistics, uses, fertility and mortality indicators, family planning measures, population stabilization**	**10**
5.	**Epidemiology– Introduction, measurements, study designs (basic, descriptive, case control, cohort and interventional studies, bias and confounding** **Disease Spread – Association and causation of disease, screening (types and their definitions), measurements in health and disease**	**20**
6.	**Environment – Meaning, theory of environment.** **Water (sources, water related diseases), air pollution (prevention and control), noise pollution (effects, prevention and control), radiation** **Communicable diseases – Infectious disease epidemiology, disease control, principles of disease prevention and control, acute respiratory illness, tuberculosis, malaria, dengue, filariasisandJE, acute diarrheal diseases, poliomyelitis, rabies, HIV/AIDS , small pox, chicken pox, measles, diphtheria, pertussis,tetanus.** **Emerging and re-emerging diseases – Influenza, ebola, zika, plague, leptospirosis, typhoid, cholera**	**30**
7.	**Non-communicable Disease (NCD) Epidemiology – Introduction, risk factors for NCD, diabetes mellitus, cardio-vascular diseases, HTN(HyperTensioN), IHD**	**15**

	(Ischemic Heart Disease), stroke, cancers, blindness	
8.	**Social and Behavioural Sciences – Clinico-social, cultural and demographic evolution of the individual.** **Humanities and Community Medicine – Social organizations with special reference to family religion, its evolution as a special instance of the evolution of social institutions, tenets of common religions in India and their influence on health and disease.** **Health economics social security in India, culture and its impact on health customs, taboos, medical social worker, doctor patient relationship**	**30**

Lab - Social and Preventive Medicine

1.	**Nutrition anddiet planning case scenarios**
2.	**Immunization spotters**
3.	**Family welfare measures and spotters**
4.	**Integrated management of neonatal and childhood illness**
5.	**Adolescent health**
6.	**Fertility indicators, dependency ratios**
7.	**Mortality indicator**
8.	**Morbidity indicators**
9.	**Sensitivity, positive predictive value, negative predictive value**
10.	**Visit to sewage treatment plant**
11.	**Visit to water works**

Reference Books

1.	**Fundamentals of social and preventive medicine**	**Barry Anthony Smithurst**	**University of Queensland Press**
2.	**A Handbook of Social and**	**Yash Pal Bedi**	**Anand Pub.**

	Preventive Medicine		
3.	**A Review of Preventive and Social Medicine**	**ChandrakantLahariya**	**JaypeeBrothers,Medical Publishers Pvt. Limited**