

FULL TIME DIPLOMA COURSE IN  
MEDICAL LAB TECHNOLOGY

( 3<sup>RD</sup> – 6<sup>TH</sup> SEMESTER )

CURRICULAR STRUCTURE  
AND  
SYLLABI

**TRIPURA UNIVERSITY**

## Curriculum Structure for Diploma in Medical Lab Technology

### Semester – III

Sl.No.	Theoretical Paper					Sectional paper			
	1 <sup>st</sup> half (50 marks)	2 <sup>nd</sup> half (50 mark)	Mark	CPW	Credit	Name of Sessional / Lab	Marks	CPW	Credit
i	Hospital Management DML-301	Biomedical Instrumentation- I DML-301	100	4	4	Biomedical Instrumentation- I Lab DML-305S	100	4	2
ii	Basic Biochemistry DML-302	Basic Biophysics DML-302	100	4	4	Basic Biochemistry Lab DML-306S	100	4	2
iii	Physiology DML-303		100	3	3	Basic Biophysics Lab DML-307S	100	4	2
iv	Anatomy , DML-304		100	3	3	Physiology Lab DML-308S	150	6	3
vi						Anatomy Lab DML-309S	150	6	3
	<b>Total</b>		<b>400</b>	<b>14</b>	<b>14</b>		<b>600</b>	<b>24</b>	<b>12</b>

**Total Credit = 26**

**Total Marks = 1000**

**CPW: 38**

Theoretical & Practical / Sessional subjects : 70% marks for end semester exam & 30% marks for internal assessment.

## Curriculum Structure for Diploma in Medical Lab Technology

### Semester – IV

Sl.No.	Theoretical Paper					Sectional paper			
	1 <sup>st</sup> half (50 marks)	2 <sup>nd</sup> half (50 mark)	Mark	CPW	Credit	Name of Sessional / Lab	Marks	CPW	Credit
i	Histopathology DML-401	Biomedical Instrumentation- II DML-401	100	4	4	Histopathology Lab DML-405S	100	4	2
ii	Parasitology & Helminthology DML-402	Analytical Chemistry DML-402	100	4	4	Parasitology & Helminthology Lab DML-406S	100	4	2
iii	Clinical Biochemistry DML-403		100	3	3				
iv	Medical Microbiology DML-404		100	3	3	Analytical Chemistry Lab DML-407S	100	3	2
v						Clinical Biochemistry Lab DML-408S	100	4	2
vi						Medical Microbiology Lab DML-409S	100	4	2
Vii						Communication Skill – II DHU- 400S	100	3	2
	<b>Total</b>		<b>400</b>	<b>14</b>	<b>14</b>		<b>600</b>	<b>22</b>	<b>12</b>

**Total Credit = 26**

**Total Marks = 1000**

**CPW: 36**

Theoretical & Practical / Sessional subjects : 70% marks for end semester exam & 30% marks for internal assessment.

## Curriculum Structure for Diploma in Medical Lab Technology

Semester – V

Sl.No.	Theoretical Paper					Sectional paper			
	1 <sup>st</sup> half (50 marks)	2 <sup>nd</sup> half (50 mark)	Mark	CPW	Credit	Name of Sessional / Lab	Marks	CPW	Credit
i	Industrial Management DHU-501	Entrepreneurship Development DHU-501	100	4	4	Project work –I DML-504S	100	5	2
ii	Haematology & Body Fluid DML-501	Biomedical Instrumentation- III DML-501	100	4	4	Haematology & Body Fluid Lab DML-505S	100	4	2
iii	Immunology DML-502		100	3	3	Biomedical Instrumentation- III Lab DML-505S	100	3	2
iv	Modern Medical Diagnostics DML-503		100	3	3	Immunology Lab DML-506S	100	4	2
v						Modern Medical Diagnostics lab DML-507S	100	4	2
vi									
Vii						Industrial Training DIT-500S	100	-	2
	<b>Total</b>		<b>400</b>	<b>14</b>	<b>14</b>		<b>600</b>	<b>22</b>	<b>12</b>

**Total Credit = 26**

**Total Marks = 1000**

**CPW: 36**

## Curriculum Structure for Diploma in Medical Lab Technology

### Semester – VI

Sl.No.	Theoretical Paper					Sectional paper			
	1 <sup>st</sup> half (50 marks)	2 <sup>nd</sup> half (50 mark)	Mark	CPW	Credit	Name of Sessional / Lab	Marks	CPW	Credit
i	Professional Ethics & Values DHU-601	Optimization Technique DHU-601	100	4	4	Project work – II DML-604S	200	8	4
ii	Serology, Biopsy & Animal Care DML-601	Protein Technology DML-601	100	4	4	Serology, Biopsy & Animal Care Lab DML-605S	100	4	2
iii	Cell and Molecular Biology DML-602		100	3	3	Protein Technology Lab DML-606S	100	4	2
iv	Elective – DML-603/1 – Quality Control DML-603/2- Medical Informatics		100	3	3	Elective Lab DML-607S	100	4	2
v						Generic Skill DHU-600S	50	2	1
vi						Final Viva DML—608S	50	-	1
	<b>Total</b>		<b>400</b>	<b>14</b>	<b>14</b>		<b>600</b>	<b>22</b>	<b>12</b>

**Total Credit = 26**

**Total Marks = 1000**

**CPW: 36**

Theoretical & Practical / Sessional subjects : 70% marks for end semester exam & 30% marks for internal assessment.

**DETAILED SYLLABI OF  
MEDICAL LAB TECHNOLOGY  
3<sup>RD</sup> & 4<sup>TH</sup> SEMESTER**

## 3<sup>RD</sup> SEMESTER

### HOSPITAL MANAGEMENT (DML-301)

#### 1<sup>ST</sup> HALF

##### **1. Hospital Organization:**

- 1.1 Classification Hospitals, Health centre, subsidiary health care.
- 1.2 Hospital Engineering.
- 1.3 Biomedical Engineering division.
- 1.4 Medical records
- 1.5 Management of Hospital out door & Indoor division.
- 1.6 Health fair.
- 1.7 Health awareness, Xenobiotics and lab safety measures & hazards.
- 1.8 Birth Control Program
- 1.9 Blind Control Program
- 2. Hospital Diet management.**
- 3. Relation between Biomedical Engineering and Medical Person.**
- 4. Difference between Hospital Management and Industrial Management.**
- 5. Biomedical waste management**

##### **Reference Books:**

1. Hospital Administration – C.M.Francis & Mario C De Souza
2. Principles of Hospital Administration and Planning- B.M.Sakharkar

-----  
2<sup>ND</sup> HALF

### BIOMEDICAL INSTRUMENTATION-I (DML-301)

##### **1. Introduction:**

- 1.a General introduction including in measurement of physiological parameters.
- 1.b Sources of bio-electric potentials, introduction of bio-potential electrodes, its necessity and its problems.
- 1.c Transducers for biomedical applications.

##### **2. Instrumentation of clinical lab:**

- 2.a Temperature measurement
- 2.b pH measurement
- 2.c Blood gas analysis ( pCO<sub>2</sub>, pO<sub>2</sub> )
- 2.d Blood cell counters (conductivity method)

##### **3. Hazards and electrical safety of medical equipment:**

- 3.a Physiological effect of electrical current
- 3.b Shock hazards of electrical equipments
- 3.c Methods of accident prevention
- 3.d Gasses and irritants

3.e Earthing and grounding

#### **4. Respiratory measurement**

4.a Measurement of pulmonary volumes and capacities

4.b Spirometry

4.c Breathing reserve

4.d Body plethysmography

#### **Reference Books:**

1. Hand Book of Biomedical Instrumentation – R S Khandlur
2. Biomedical Instruments – R S Khandlur
3. Radiographic Imagins – DN & MO Chesney.
4. X-Ray equipment fastudents Radiographics – DN & MO Chesney
5. Medical Electronics – S Sarkar
6. Principle of Medical Electronics & Biomedical Instrumentation- C Raja Rao & S K Guha
7. Biomedical instruments & Measurements – Creamwell
8. Biomedical Instruments – Khandlur
9. Medical Electronics – D Jemice

-----

## **1<sup>ST</sup> HALF**

### **BASIC BIOCHEMISTRY(DML-302)**

#### **GROUP-A**

##### **1. Basic chemistry of Carbohydrates:**

Definition and function, classification, isomerism of monosaccharide.

Properties of monosaccharide, study of disaccharides and polysaccharides.

##### **2. Chemistry of lipids:**

Definition, function and classification of lipids.

Classification, isomerism and properties of fatty acids and fats.

##### **3. Chemistry of proteins:**

Definition, function and properties of proteins.

Amino acids, their function, classification, isomerism, properties.



## GROUP-B

### 4. Enzyme chemistry:

- a. Definition and classification of enzyme
- b. Kinetics of enzyme
- g. Mechanism of action
- c. Factors affecting enzyme activity
- h. Clinical importance of Enzymes & Isoenzymes-
  - Diagnostic
  - Therapeutic

### 5. Vitamins and minerals:

Definition, classification and clinical importance. Importance of water balance.

#### Reference Books:

1. Biochemistry – West & TOHZ
2. Biochemistry – Harper
3. Biochemistry – Thorpe
4. Biochemistry – Fearom
5. Pathological Biochemistry – Duncan
6. Biochemistry – Leninger

-----

2<sup>ND</sup> HALF

## BASIC BIOPHYSICS(DML-302)

## GROUP-A

### MODULE:

#### 1. Principles of biophysics:

- a. Osmosis & osmotic pressure
- b. Surface tension
- c. Colloid & colloidal system
- d. Diffusion, viscosity
- e. Endocytosis, phagocytosis and pinocytosis

#### 2. Acid-base and pH chemistry:

Study of Acid, Base, Buffers, pH, and Handerson-Hasselbalch equation.  
Significance of pH in our body  
Acidosis and alkalosis

#### 3. Atomic structure:

- a. Isotopes & radio-isotopes
- b. Application of isotopes in medical practice

## GROUP-B

### MODULE:

#### 4. Solution:

- a. Normal solution, molar solution
- b. Isotonic, hypertonic, hypotonic solution
- c. W/V and % solution

#### 5. Dialysis:

- a. Cell & cell organelle, structure of cell membrane
- b. Dialysis, haemodialysis, electro dialysis

#### 6. Transport of metabolites across biological membrane

- a. Semi permeable membrane
- b. Simple diffusion
- c. Active transport
- d. Passive transport
- e. Voltage gated and ligand gated channel.

#### Reference Books:

1. Viva & Practical Biochemistry & Biophysics – Dr R N Roy
2. A Text book of Biophysics – Dr. R N Roy
3. Biophysics & Biophysical Chemistry- Debajyoti Das
4. Medical Biophysics- R.N.Roy

---

## PHYSIOLOGY (DML-303)

### 1<sup>ST</sup> HALF

### MODULE:

#### 1. CELLS & TISSUES

CELL: Type – Structure – Shape – Organelles – Function – Cell Membrane (structure, function and permeability) – Cancer Cell.

- 1.1 TISSUE: Types – Structure – Function – Distribution.

#### 2. HEAMATOPOEITIC SYSTEM

BLOOD: Composition – Function.

- 2.1 PLASMA: Plasma Protein – Properties – Origin – Function.

- 2.2 RED BLOOD CORPUSCLES: Origin – Function – Total Count – Fate – HAEMOGLOBIN (Chemical nature – Synthesis – Function – Fate) – Packed Cell Volume – Mean Corpuscular Haemoglobin Concentration – Blood Volume – Colour Index – Erythrocyte Sedimentation Rate

- 2.3 **WHITE BLOOD CORPUSCLES:** Origin – Life Span – Types – Morphology – Function – Fate – **Differential Count.**
- 2.4 **PLATELET:** Origin – Function
- 2.5 **CLOTTING:** Mechanism – Factors affecting acceleration and retardation – **Bleeding Time – Clotting Time – Prothrombin Time.**
- 2.6 **BLOOD GROUPING:** Mechanism – Determination – Importance.

### **3. CARDIOVASCULAR SYSTEM**

- 3.1 Structure of heart & heart muscle – Properties of heart muscle.
- 3.2 Cardiac Cycle – Blood Pressure – Pulse – Arterial & Venous system, comparison
- 3.3 **Echo Cardio Graph:** Biophysical principle of ECG – Analysis of ECG – Vector cardiogram – Sketch diagram of Heart & Cardiovascular system and Blood flow.

### **4. RESPIRATORY SYSTEM**

Sketch diagram of Respiratory tract and mechanism of respiration.

- 4.1 Different Respiratory Volume – Spirometer – Pneumograph.
- 4.2 Oxygen and Carbon dioxide carriage.

### **5. DIGESTIVE SYSTEM**

Sketch diagram of Digestive Tract – Function of Juice.

- 5.1 Liver structure – Function – **Liver Function Test.**
- 5.2 Hepatobiliary System: Sketch diagram – Bile – Functions.

## **2<sup>ND</sup> HALF**

### **6. NERVOUS SYSTEM**

- 6.a Structure of nerve – Velocity of impulse through nerve – Depolarisation – Repolarisation of nerve – Neurone – Neuroglia.
- 6.b Sketch diagram of **Central Nervous System – Autonomic Nervous System – Cranial Nerves** (origin, distribution, nature & termination).
- 6.c **CNS:** Cross section of Spinal Cord & Reflex Arc – Function of Cerebrum & Cerebellum – **Cerebral Spinal Fluid**
- 6.d **ANS:** Sympathetic and parasympathetic – Chemical transmitter – Functions

### **7. SPECIAL SENSES**

- 7.a Structure of Eyeball – Mode of Rotation of Eyeball – Physiology of Vision – Error of Refraction.
- 7.b Different parts of Ear – Mechanism of hearing.
- 7.c Test Bud – Mechanism of Test sensation – Olfaction.

### **8. REPRODUCTIVE SYSTEM**

- 8.a Sketch diagram of male and female reproductive systems – Structure & Function.
- 8.b Process of Fertilisation and Ovulation – Placenta & its function.

8.c Physiological changes during pregnancy – Primary and secondary sex organ – Character – Puberty – Menopause – Pregnancy test.

### **9. EXCRETORY SYSTEM**

9.a Macro & microscopical structure of Kidney – Function of kidney – Mechanism of Urine formation – Function of Renal Tubules

9.b Mechanism of filling of Urinary Bladder – Evacuation of urine – Normal & abnormal composition of urine.

### **10. ENDOCRINE SYSTEM**

10.a Different Endocrines, location with sketch diagram

10.b Hypothalamus as an endocrine organ – Hormones of Pituitary & Thyroid and their functions – Pancreas & its hormones

10.c Adrenal Gland – Hormones of Adrenal Cortex & Adrenal Medulla and their functions.

### **REFERENCE BOOKS**

1. Physiology / Best & Taylor
2. Physiology / Guyton
3. Applied Physiology / Samson Wright, Editor O. Neil
4. Physiology / C.C. Chatterjee
5. Anatomy & Physiology / Ross & Wilson
6. Pathologic Physiology / Sodeman
7. Practical Physiological Chemistry / Hawk
8. Handbook of Human Physiology / P.K. Das
9. Physiology / Penny

-----

## **ANATOMY(DML-304)**

### **1<sup>ST</sup> HALF**

MODULE:

#### **1. HUMAN SKELETON**

Name of the bones – Number of bones – Different structure (upper extremities, lower extremities, head and neck, abdomen, thorax)

#### **2. MACRO & MICROSTRUCTURES OF BONES**

Different parts of bones — Parts of different types of vertebra, humerus, femur, tibia.

#### **3. JOINTS**

Joints of different types articulating bones

## **2<sup>ND</sup> HALF**

### **4. SURFACE ANATOMY**

Heart – Lungs – Liver – Gall Bladder – Stomach – Spleen – Kidney – Appendix.

### **5. MACROSCOPICAL STRUCTURE OF VISCERA**

Shape – Border – Covering – Adjacent Structure – Position – Blood Supply – Nerve Supply

### **6. STRUCTURAL & FUNCTIONAL UNITS IN DIFFERENT SYSTEMS**

Cardio Vascular System – Alimentary System – Urinary System – Reproductive System – Nervous System.

## **REFERENCE BOOKS**

1. Gray's Anatomy
2. Anatomy / Samar Mitra / Academic Publisher
3. Anatomy / Sahanuiza / Central Book Agency
4. Anatomy & Physiology / Ross & Wilson
5. Anatomy / B.D. Chowrasia
6. Dissection Anatomy / Curningham
7. Osteology / Frazer
8. Human Anatomy / A.K. Dutta

---

## **BIOMEDICAL INSTRUMENTATION-I LAB (DML-305S)**

### **Detail contents:**

1. Temperature measurement
  2. pH measurement
  3. Blood gas analysis ( pCO<sub>2</sub>, pO<sub>2</sub> )
  4. Blood cell counters (conductivity method)
  5. Flame photometry
  6. Experiments of basic bio-potential electrodes.
-

## **BASIC BIOCHEMISTRY LAB(DML-306S)**

### **Detail contents:**

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.
- 

## **BASIC BIOPHYSICS LAB (DML-307S)**

### **Detail contents:**

1. Cleaning & drying techniques of different glass ware & plastics.
  2. Preparation of solution of different strength and their standardization.
  3. Acid-alkali titration.
  4. Preparation of buffers.
  5. Detection & setting of pH of different solutions.
  6. Separation of molecules by dialysis.
  7. Purification of compounds by passing through semi-permeable membrane.
  8. Performing experiments on diffusion.
- 

## **PHYSIOLOGY LAB(DML-308S)**

### **BLOOD EXAMINATION**

1. To identify blood cells.
2. To determine the **Total Count** and **Differential Count** of a given sample of blood.
3. To estimate the **Haemoglobin** percentage in a given sample of blood.
4. To determine the **Erythrocyte Sedimentation Rate** of a given sample of blood.
5. To determine the **Bleeding Time** and **Clotting Time** of a given sample of blood.
6. To determine the **Haematocrite** value of a given sample of blood.

7. To determine the **Packed Cell Volume, Mean Corpuscular Volume, Mean Corpuscular Haemoglobin Concentration and Colour Index** of a given sample of blood.

#### **URINE EXAMINATION**

1. Introduction to abnormal constituents of urine
2. To determine the percentage of albumin and bilirubin in a given sample of urine.
3. To determine the percentage of sugar in a given sample of urine.
4. To determine the percentage of microscopically puscell and RBC in a given sample of urine.
5. To determine the specific gravity of a given sample of urine.

#### **CHARACTERISTICS OF URINE**

1. To determine the physical characteristics of a given sample of urine.
2. To determine the biochemical and microscopical characteristics of a given sample of urine.
3. To determine the bacteriological characteristics of a given sample of urine.

-----

## **ANATOMY LAB(DML-309S)**

#### **OSTEOLOGY**

1. To determine the anatomical position and plane, elementary anatomy of different system using skeleton.
2. To identify: Skull – Cranium – Face – Hyoid – Vertebral Column – Vertebra – Sternum – Ribs – Scapula – Humerus – Radius – Ulna – Carpals – Metacarpals – Pelvicgridles – Femur – Tibia – Fibula – Tarsal – Metatarsals – Phalanges.

#### **SYSTEMIC ANATOMY**

3. To dissect digestive system in toad.
4. To identify different parts of brain.
5. To identify different parts of heart in toad.
6. To study different properties of muscle by kymograph.
7. To identify different parts of reproductive and excretory system in toad.

-----

# 4<sup>TH</sup> SEMESTER

## HISTOPATHOLOGY(DML-401) 1<sup>ST</sup> HALF

### MODULE:

#### 1. Introduction

- a. The cell, metabolism of cell
- b. Cell division
- c. Outline of tissue examination

#### 2. Fixation and decalcification

- a. Fixation and different types of fixatives
- b. Fixation of smears and specimens
- c. Secondary fixation
- d. Decalcification

#### 3. Processing

- a. Dehydration and cleaning
- b. Impregnation and embedding
- c. Gelatin embedding & plastic embedding

#### 4. Section cutting

- a. Microtome in detail
- b. Section cutting

#### 5. Theory of staining

- a. Chemistry and classification of dye
- b. Natural dye, synthetic dye, basic dye, acidic dye and neutral dye.
- c. Staining properties of dyes
- d. Methodology of staining
- e. Haematoxylin staining solution

#### 6. Staining of carbohydrates, lipids, CNS and tissues.

### Reference Books:

1. Medical Laboratory Technology – J Ochei & A Kolhatkar
  2. Medical Laboratory Technology – Ramnik Sood
  3. Medical Laboratory Technology-Kanai Lal Mukherjee
  4. Practical Pathology – P Chakraborty & Gargi Chakraborty
  5. The Text Book of Pathology- Harsh Mohan
-



## **BIOMEDICAL INSTRUMENTATION-II (DML-401)**

### **MODULE:**

#### **1. X-Ray machine:**

- a. Properties of X-Ray.
- b. Photo electric effect
- c. X- ray tube- Stationary & rotating anode
- d. Typical X-Ray machine
- e. Visualisation of X-rays

#### **2. Haemodialysis machine:**

- a. Definition of dialysis and different types haemodialysis machine
- b. Different dialysis membrane
- c. Performance analysis
- d. Clinical application

#### **3. Study with principle, block diagram, properties and application**

- a. C.T.Scan.
- b. Ultra Sonography (USG) machine
- c. EMG
- d. ERG
- e. Defibrillator
- f. ECG
- g. Foetal Monitoring

#### **Reference Books:**

1. Hand Book of Biomedical Instrumentation – R S Khandlur
  2. Biomedical Instruments – R S Khandlur
  3. Radiographic Imagins – DN & MO Chesney.
  4. X-Ray equipment fastudents Radiographics – DN & MO Chesney
  5. Medical Electronics – S Sarkar
  6. Principle of Medical Electronics & Biomedical Instrumentation- C.R.Rao & S K Guha
  7. Biomedical instruments & Measurements – Creamwell
  8. Biomedical Instruments – Khandlur
  9. Medical Electronics – D Jemice
-

**DML-402**  
**1<sup>ST</sup> HALF**  
**PARASITOLOGY & HELMINTHOLOGY**

**GROUP-A**

MODULE:

**1. Parasitology:**

- 1.1 Definition of parasite
- 1.2 Types of parasites
- 1.3 General characteristics of parasite
- 1.4 Route of infection
- 1.5 Site of infection

**2. Malaria Parasites:**

- 2.1 Different types of malaria parasites
- 2.2 Route of infection
- 2.3 Site of infection
- 2.4 Re-production
- 2.5 Manifestation of Malaria

**3. Kal-a-zar:**

- 3.1 Characteristics
- 3.2 Route of infection
- 3.3 Site of infection
- 3.4 Re-production
- 3.5 Manifestation of disease

**GROUP-B**

**4. Fileria:**

- 4.1 Characteristics
- 4.2 Route of infection
- 4.3 Site of infection
- 4.4 Manifestation of disease

**5. Helminthiasis:**

- 5.1 General nature
- 5.2 Features
- 5.3 Route of infection
- 5.4 Site of multiplication

**6. Mode of action and study of antihelminthic drugs.**

**Reference Books:**

- 1. Text Book of Medical Parasitology- C.K.Jayaram Paniker
- 2. Medical Parasitology- R.L.Ichhpujari & Rajesh Bhatia
- 3. General Parasitology- Thomas C. Cheng
- 4. A Text Book of Pathology- N.C.Dey & T.K.Dey

-----  
2<sup>ND</sup> HALF

## ANALYTICAL CHEMISTRY (DML-402)

### GROUP-A

MODULE:

**1. Basics of clinical analysis:**

Calculations for dilution, preparation of different types of solution (O/W, W/O), Suspension, proof spirit, rectified spirit etc.

**2. Optimization techniques:**

**3. Oxidation-reduction reaction, titration (acid-base & non-aqueous, indicators used).**

**4. UV-Vis spectrophotometric analysis:**

- a. Principle
- b. Lambert-Beer law, combined law
- c.  $\lambda_{\text{max}}$ , calibration curve
- d. Instrumentation and application
- e. Colorimetric analysis

**5. pH meter:**

- a. Principle
- b. Electrodes
- c. Instrumentation
- d. Application

### GROUP-B

MODULE:

**6. Chromatography:**

- a. Principle and different types of chromatography
- b. Solid phase & liquid phase.
- c. Different parameters of qualitative and quantitative analysis
- d. Details of thin layer chromatography
- e. Details of paper chromatography

**7. Flame photometric analysis:**

- a. Principle
- b. Instrumentation
- c. Analysis of ions
- d. Clinical application

**8. Autoanalyser:**

- a. Types and characteristics
- b. Instrumentation
- c. Limitation

d. Application

**Reference Books:**

1. Medical Laboratory Technology- Kanai Lal Mukherjee
  2. Practical Clinical Biochemistry- Ranjana Chawla
  3. Medical Laboratory Technology- Kolhatkar
  4. Medical Laboratory Technology- Ramnik Sood
  5. Basic Separation Techniques in Biochemistry- R.O.Okotore
- 

## **CLINICAL BIOCHEMISTRY (DML-403)**

### **1<sup>ST</sup> HALF**

**MODULE:**

1. Biochemical estimation of – Plasma Protein, Sugar estimation (PP), (F), (R), total glucose, True glucose.
2. Blood urea, Uric Acid, Creatinine, Cholesterol, Tri-glycerides, VDL, HDL, VLDL, LDL, Electrolytes.
3. Liver function tests: Bilirubin, SGPT, SGOT, Serum Alkaline Phosphatase.
4. Serum Protein, Serum Albumin, Serum Globulin, A:G Ratio.
5. Hormone Estimation: T<sub>3</sub>, T<sub>4</sub>, TSH, LH, FSH, Androgen, Estrogen, Progesterone, CCK.
6. CSF – Composition, source functions, applied physiology, collection and analysis
7. Urine – Composition, total amounts for 24 hrs. collection and analysis. Abnormal constituents of urine, 17 Keto steroid.

### **2<sup>ND</sup> HALF**

8. Detection of Graves Diseases.
9. Stool – for routine examination, occult blood test, Benzidine test.
10. Examination of Gastrointestinal Contents.
11. Sputum examination.
12. Endocrine Function Tests.
13. Pregnancy Test.
14. Renal Function Evaluation Test.
15. Detection of – Carcino Embryonic Antigen (CEA), Cancer Reactive Proteins (CRP), Prostate Specific Antigen (PSA).
16. Rheumatoid Factor, ASO Titre.

**Reference Books:**

1. Biochemistry – West & TOHZ
  2. Biochemistry – Harper
  3. Biochemistry – Thorpe
  4. Biochemistry – Fearom
  5. Pathological Biochemistry – Duncan
  6. Biochemistry – Leninger
  7. Biochemistry – Balcarage & King
  8. Viva & Practical Biochemistry & Biophysics – Dr R N Roy
  9. Text book of Biophysics – Dr. R N Roy
- 

## **MEDICAL MICROBIOLOGY(DML-404)**

### **1<sup>ST</sup> HALF**

**MODULE:**

**1. Introduction of microbiology, Types and Classification of microbes.**

**2. Bacteriology:**

- a. Introduction
- b. Morphology
- c. Nutritional requirements & growth
- d. Classification and identification of bacteria.

**3. Study of-** a. Different sterilization methods

- b. Autoclave
- c. Laminar air flow system.

**4. Preparation of culture media:**

- a. Composition
- b. Preparation of different media
- c. Procedure of isolation of bacteria
- d. Culture of bacteria

### **2<sup>ND</sup> HALF**

**5. Virology:**

- a. Definition and Classification of virus
- b. Nature or Characteristics of virus
- c. Mode of infection of virus
- d. Virus producing diseases

**6. Mycology:**

- a. Definition and classification
- b. Characteristics of fungus
- c. Mode of infection
- d. Manifestation of fungal infection.

**7. Study of following organisms:**

- a. Staphylococci
- b. Streptococci
- c. Neisseria
- d. E.Coli
- e. Mycobacterium
- f. Corynebacterium diphtheriae
- g. Hepatitis virus
- h. HIV

**Reference Books:**

- 1. Text Book of Microbiology- Ananthanarayan & Paniker
  - 2. Medical Microbiology- R.Panjarathinam
  - 3. Microbiology for the Health Sciences- G.R.W.Buston & P.G.Engelkirk
  - 4. Microbiology- A Introduction- Tortora, Funke & Case
  - 5. Microbiology for MLT- Namita Jaggi
  - 6. The Short Text Book of Medical Microbiology- Satish Gupte
- 

## **HISTOPATHOLOGY LAB (DML-405S)**

**EXPERIMENTS:**

- 1. Collection and storage of tissue samples
- 2. Processing of samples for sectioning
- 3. Staining of tissue samples
- 4. Fixation and decalcification of samples
- 5. Examination of tissue samples for determination of different parameters.

## **PARASITOLOGY & HELMINTHOLOGY LAB (DML-406S)**

### **Detail contents:**

1. Demonstration of Malaria parasites in trophozooid form ring form (*Plasmodium vivax*, *falciferum*).
2. Demonstration of *Leishmania donovani*
3. Demonstration of *Wuchereria bancrofti*
4. Their mode of collection & staining.
5. Identification of malaria parasite from blood, etc.
6. Identification of *Leishmania* from samples.
7. Identification of disease like- filaria, kala-azar.
8. Identification of malaria parasite from blood by agglutination assay.

## **ANALYTICAL CHEMISTRY LAB(DML-407S)**

### **Detail contents:**

1. Preparation of different solutions.
2. Determination of  $\lambda$ -max different molecules.
3. Non-aqueous titration.
4. Optimization of spectrophotometric data.
5. Determination of calibration curve.
6. Analysis of coloured solutions.
7. Detection of  $R_f$  value of different components.
8. Detection of ions  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Ca}^{++}$  by flame photometer.
9. Qualitative and quantitative analysis of samples by TLC, Paper chromatography.
10. Determination of pH of different solutions.
11. Preparation of Tri-sodium citrate (3.8%), HCl (N/10), Isotonic solution (0.9%).

-----

## **CLINICAL BIOCHEMISTRY LAB(DML-408S)**

## **1. Identification**

- 1.1 Urine, Sugar
- 1.2 Urea estimation
- 1.3 Bile salt & pigment

## **2. Observation**

- 2.1 CSF
- 2.2 Peritoneal fluid, pericardial fluid, pleural fluid

## **3. Estimation**

- 3.1 Total acidity of gastric juice
- 3.2 Blood Sugar (PP), (F), (R)
- 3.3 Blood urea, creatine creatinine, NPN cholesterol, uric acid, alkaline phosphatase, SGPT, SGOT, bilirubin, electrolytes ( $\text{Na}^+$ ,  $\text{k}^+$ ,  $\text{Cl}^-$ ),  $\text{Ca}^{++}$ , Albumin, Globulin
- 3.4 Estimation of serum  $\text{T}_3$ ,  $\text{T}_4$ , TSH.
- 3.5 Estimation of serum Cholesterol, Tri-glycerides, VDL, HDL, VLDL, LDL.

-----

# **MEDICAL MICROBIOLOGY LAB (DML-409S)**

## **Detail contents:**

- 1. Preparation of different culture media (solid media and liquid media).
- 2. Sterilization of different culture media and sterility testing.
- 3. Culturing different bacterial strains on culture media.
- 4. Isolation of bacteria from the infected area such as throat swab, urethral smear, vaginal smear, tear, wounds, septic focus.
- 5. Collection of sputum for 24 hours & identification Acid fast bacilli (Concentration method).
- 6. Collection of urine for 24 hours & different test of it (Qualitative, culture, microscopical etc.)
- 7. Composition of different stain & Procedure of staining such as Gram's stain, Zeil Nelson stain etc.
- 8. Identification of gram positive and gram negative bacteria by staining.

-----



**Total Marks : 100, CPW : 4 , Credit : 2**

**DETAIL COURSE CONTENT**

MODULE –1 LOOKING FOR A JOB

8 PERIODS

- 1.1 Identifying Sources — Skimming Newspapers for Information**
- 1.2 \*JOB INTERVIEWS Preparing for an interview — Responding Appropriately — Group Discussions — Using Language Effectively for Interaction**  
**\*Mock interviews are to be arranged and to be conducted by any suitable person**
- 1.3 Preparation of C.V.**

MODULE –2 PHONETICS

12 PERIODS

- 2.1 The speech mechanism**
- 2.2 Speech sounds : Vowels & consonants**
- 2.3 Phonetic symbols**
- 2.4 The syllable**
- 2.5 Intensive drilling in phonetic skills, and accent and intonation**

MODULE –3 WRITING SKILLS

8 PERIODS

- 3.1 Writing using a variety of simple and complex sentences and a range of subordinate and co-ordinate clauses of time, manner, reasons, relation, results etc.**
- 3.2 Knowledge to construct a coherent and cohesive text, using a range of cohesive devices dealing with consequences, addition, concession, apposition, agreement, contrast.**
- 3.3 Dialogue writing considering various purposes – formal, semi-formal, informal**

MODULE – 4 DEVELOPING CONVERSATIONAL SKILLS

6 PERIODS

**Develop different forms of conversation, formal or informal in different situations like–**

- a) Greetings, Salutations**
- b) Asking the way**
- c) In the Post office**
- d) Catching a train**
- e) Booking a room at a hotel**
- f) At the bank**
- g) Making a telephone call**
- h) At the police station**
- i) Receiving and seeing off a guest.**

- 5.1 **Methods of speaking – speaking from a manuscript – speaking from memory – Impromptu delivery – extemporaneous delivery.**
- 5.2 **Analysing the Audience.**
- 5.3 **Organizing the presentation – Using visual Aids – Designing and presenting visual Aids.**

Examination Scheme:

1. **Continuous internal assessment of 30 Marks is to be carried out by the teachers through out Part-II 4<sup>th</sup> Semester.**
2. **External Assessment of 70 Marks shall be held at the end of the part – II 4<sup>th</sup> Semester on the entire syllabus. Distribution of Marks : Looking for a Job : 10, Phonetic : 15, writing Skills : 10 Developing conversational skills : 10, Making presentations : 25.**

**TEXT BOOK AND OTHER RECOMMENDED BOOKS**

ENGLISH SKILLS for Technical Students – TEACHERS' HANDBOOK / West Bengal State Council of Technical Education in collaboration with THE BRITISH COUNCIL / Orient Longman – Business Correspondence, by V.G. Natu and C Kaur – Professional Communication Skills, by Pravin Bhatia and A.M. Shaikh – English Grammar, by Wren & Martin

- A text book of English : Phonetics for Indian Students / T. Balasubramanian / Macmillan India Ltd., Writing skills – A. Parry, S. Harlle and M. Bartram.

**INDUSTRIAL MANAGEMENT**  
(DHU 501) 1<sup>ST</sup> HALF , Full Marks: 50, Credit : 2, CPW: 2

**Introduction to Management Science**

Principles & functions of management — Contributions of F.W. Taylor, Henry Fayol, Max Weber in development of the theories of management science.

**Organisational Behaviour**

Objectives — Brief introduction to: Motivation– Perception – Leadership & Leadership Styles – Communication – Team Building – Work Culture.

**Human Resources Management**

Scope & Functions – Human Resources Planning – Selection & Recruitment – Training & Development – Performance Appraisal .

**Production & material Management**

Production Planning: Routing – Loading – Scheduling — Production Control: Expediting – Dispatching — Materials Handling Inventory Management Inventory Management — Productivity — Quality Management: Tools & Techniques – Quality Management System.:

**Financial Management**

Financial Ratios — Elements of Costing — Auditing

**Marketing & Sales Management**

Marketing of products & Services — Advertising & Sales Promotion — Consumer Behaviour.

**REFERENCE BOOKS**

Essentials of Management / Kontz / McGraw-Hill of India

Organization & Behaviour / M. Banerjee / Allied Publishers

Human Behaviour at Work: Organizational Behaviour / Keith Davis & Newstrom / McGraw-Hill of India

Human Resources Management / Mirza Saiyatain / Tata McGraw-Hill

Production Management & Control / Nikhil Bharat / U.N. Dhar & Co.

Production Management / Keith Lockyer / ELBS

Marketing Management / Philip Kotler / Prentice Hall of India

Lectures on Management Accounting / Dr. B.K. Basu / Basusri Bookstall, Kolkata

An Insight into Auditing: A Multi-dimensional Approach / Dr. B.K. Basu / Basusri Bookstall, Kolkata

Business Strategies, Financial Management & Management Accounting / S.K. Poddar / The Association of Engineers (India)

**ENTREPRENEURSHIP DEVELOPMENT**  
(DHU 501) , 2<sup>ND</sup> HALF , Full Marks: 50, Credit : 2, CPW: 2

**DETAIL COURSE CONTENT**

**Entrepreneurial Development**

Definition of entrepreneurship, Characteristics of entrepreneurship, Factors influencing entrepreneurship, Types and Functions of Entrepreneurs.

Need for promotion of entrepreneurship, Entrepreneurial Environment, Govt. policies for setting-up new small enterprises.

**Planning a SSI**

What is planning, Types of planning, Importance of planning, Steps in planning.,Steps for starting a small enterprise. ,Commercial Banks and Financial Institutions.

**Problems of Small Industries**

Power shortages, Project planning, Finance.,Raw materials, Production constraints, Marketing. ,Personal constraints, Regulation., Entrepreneurial Motivation Training, Motivating factors of Entrepreneurs, Achievement Motivation, Institutions assisting entrepreneurs.

**REFERENCE BOOKS**

Starting your own business, A step-by-step Blue print for the first-time Entrepreneur – Stephen C. Harper, McGraw-Hill

Harward Business Review on Entrepreneurship – Harward Business School Press.

Entrepreneurship Development in small scale – proceedings of National Seminar, DCSSI, New Delhi – Patel, V.G.

Entrepreneurship: Strategies & Resources – Abrams Grant Pass. Oregon: Oasis press.

The Business Planning Guide – David H Bangs, Upstart Publishing Company in Chicago.

Entrepreneurship Development in India – Dr. C.B. Gupta, Dr. N.P. Srinivasan, Sultan Chand & Sons.

Entrepreneurship – Madhurima Lall and Shikha Sahai, Excel Books.

**(DML-501)**

# 1<sup>ST</sup> HALF

## HAEMATOLOGY & BODY FLUIDS

### GROUP-A

#### 1. Blood:

- 1.1 Definition & introduction
- 1.2 Total count of R.B.C and estimation of P.V.C., M.C.V. Colour index, MCH, MCHC, ESR determination, significance of each.
- 1.3 Differential count of WBC & significance
- 1.4 Mechanism of coagulation, BT, CT, Prothombin time.
- 1.5 Separation of blood cells, plasma & serum.
- 1.6 Blood Bank, Storage mechanism of whole blood packed cell volume.
- 1.7 VDRL, Wasserrman reaction for syphilis test, HIV (Elisa Test).

### GROUP-B

#### 2. Body fluid:

- 2.1 Peritoneal fluid, collection, composition, & analysis.
- 2.2 Pericardial fluid – Collection, Composition & analysis.
- 2.3 Lacrimal fluids – Collection, Composition & analysis.
- 2.4 Throat swab – Collection, Composition & analysis.
- 2.5 Vaginal smear – Collection & analysis.
- 2.6 Urethral smear – Collection & analysis.
- 2.7 Semen – Collection, Composition & analysis. Motility Count.
- 2.8 Stool – for routine examination, occult blood test, Benzidine test.

#### Reference Books:

1. Haematology by Davidson
2. Clinical Haematology in Medical Practice by Frkin, chestorman, peninston & Rush
3. Viva in Bactical Haematology by P.Parkash.
4. Medical Laboratory Technology- Kolhatkar
5. Medical Laboratory Technology- Ramnik Sood
6. Text Book of Pathology- Harsh Mohan
7. Recent advances in pathology- K.P.Deodhar & Ulwagholikar

-----

**(DML-501)**  
**2ND HALF**

**BIOMEDICAL INSTRUMENTATION-III**

**GROUP-A**

**1. CARDIAC MEASUREMENT:**

- 1.1 Engineering Analog of heart, model of heart
- 1.2 Characteristics of blood flow
- 1.3 Types and causes of heart sound
- 1.4 Electrocardiograph and its features- electrode & its placement
- 1.5 Measurement of blood flow and cardiac output
- 1.6 Noises and interference's in the measurement and its solution
- 1.7 Plethysmography
- 1.8 Blood pressure measuring instruments- invasive & non-invasive, manual, semi-automatic & automatic type ( detail of sphygmomanometer).
- 1.9 Pacemaker and its use
- 1.10 Defibrillators

**2. EEG:**

- 2.1 Wave form
- 2.2 Machine block diagram & discussion
- 2.3 Electrodes of EEG in brief

**GROUP-B**

**3. ICU/CCU SYSTEM:**

1. Introduction
2. Recording instruments
3. Alarm Modules
4. Display
5. Information
6. Strip chart recorder
7. Electronic recorder
8. Adjustment and typical faults

**4.0 BIO TELEMETRY:**

- 4.1 Introduction of bio telemetry
- 4.2 Physical parameters adaptable to bio telemetry
- 4.3 Components of bio telemetry
- 4.4 Multi-patient telemetry.

**Reference Books:**

1. Hand Book of Biomedical Instrumentation – R S Khandlur

2. Biomedical Instruments – R S Khandlur
  3. Radiographic Imagins – DN & MO Chesney.
  4. X-Ray equipment fastudents Radiographics – DN & MO Chesney
  5. Medical Electronics – S Sarkar
  6. Principle of Medical Electronics & Biomedical Instrumentation- C.R.Rao & S.K.Guha
  7. Biomedical Instruments & Measurements – Croamwell
- 

## **IMMUNOLOGY(DML-502)**

### **1<sup>ST</sup> HALF**

#### **1. Introduction:**

- a. Innate immunity
- b. Adaptive immunity
- c. Cell mediated immunity

#### **2. Cells & organs of immuno system:**

- a. Bone marrow- stem cells, granulocytic cells
- b. Lymphoid organs- B lymphocytes & T lymphocytes

#### **3. Recognition of antigen:**

- a. Generation and Structural variations of immunoglobulin
- b. Immuno response mechanism-I
- c. Immuno response mechanism-II
- d. Cytokines

#### **4. Immunoglobulin:**

- 4.1 Structural analysis of immunoglobulin
- 4.2 Study of immunoglobins- IgG, IgM, IgE, IgA, IgD
- 4.3 Importance of immunoglobulin
- 4.4 Genetics of antibody diversity

### **2<sup>ND</sup> HALF**

**5. Study of Ab-Ag reaction mechanism:**

- 5.1 In-vivo Ab-Ag reaction
- 5.2 In-vitro Ab-Ag reaction
- 5.3 Monoclonal and polyclonal antibody
- 5.4 detection and application of Ab-Ag reaction

**6. Allergy and hypersensitivity reaction:**

- 6.1 Anaphylactic reaction
- 6.2 Antibody dependent cytotoxic hypersensitivity

**7. Immunization:**

- 7.1 Active immunization
- 7.2 Passive immunization
- 7.3 Toxoids
- 7.4 Sera and vaccines
- 7.5 Medical application of immunization

**8. Study of disorders of immunity:**

- 8.1 B- Cell cancer
- 8.2 AIDS
- 8.3 Autoimmunodisorders- e.g. Autoimmuno Anemia, Thyroiditis.
- 8.4 Systemic immuno disorders- e.g. Multiple Sclerosis, Rheumatoid Arthritis.

**Reference Books:**

- 1. Immunology: Introductory Text Book- Nandini Shetty
- 2. Immunology- Kuby
- 3. Immunology- A Short Text Book- Md. Akram Hossain
- 4. Immunodiagnostics- S.C.Rastogi

-----

**MODERN MEDICAL DIAGNOSTICS (DML-503)**

Study of preliminary technological aspect and application of following diagnostic tools for diseases diagnosis (**these technological studies should be very preliminary as per Diploma standard**)-

**1<sup>ST</sup> HALF**

**1. PCR:**

- 1.1 Amplification of DNA by PCR
- 1.2 Different type of PCR



- 1.3 Performing PCR
- 1.4 Application

**2. SDS-PAGE:**

- 2.1 Separation of protein by SDS-PAGE
- 2.2 Block diagram
- 2.3 Performing SDS-PAGE
- 2.4 Application of SDS-PAGE
- 2.5 Other Acrylamide Gel Electrophoresis

**3. Agarose Gel Electrophoresis:**

- 3.1 Separation of DNA/RNA by electrophoresis
- 3.2 Block diagram
- 3.3 Performing Agarose gel electrophoresis
- 2.4 Application of agarose gel electrophoresis

**4. Western Blotting:**

- 4.1 Basic technology of Western blotting
- 4.2 Identification of protein by western blotting
- 4.3 Block diagram
- 4.4 Application
- 5. DNA Fingerprinting

**2<sup>ND</sup> HALF**

**6. Immuno Dot-blot Analysis:**

- 6.1 Basic technology
- 6.2 Membrane used
- 6.3 Blotting protein
- 6.4 Identification of protein
- 6.5 Application

**7. Fluorescence Spectroscopy:**

- 7.1 Basics of spectroscopy
- 7.2 Basics of fluorescence
- 7.3 Application

**8. FNAC:**

- 8.1 Basics of cytology
- 8.2 FNAC technology in brief
- 8.3 Application

**9. Cell Culture technique:**

- 9.1 Cell culture
- 9.2 Cell line
- 9.3 Maintenance of cell culture

**10. Iso-electric Focusing:**

- 10.1 Basics of protein separation by IEF
- 10.2 Application

**Reference Books:**

1. Cell and Molecular Biology- S.C.Rastogi
  2. Biochemistry- Debajyoti Das
  3. Immunology: Introductory Text Book- Nandini Shetty
  4. Human Physiology: Vol-1- Dr.C.C.Chatterjee
  5. Immunology- Kuby
  6. Lehninger's Principles of Biochemistry-Fourth Edition
  7. Harper's Illustrated Biochemistry, 26<sup>th</sup> Edition
  8. Modern Concept of Biotechnology- H.D.Kumar
- 

## **SESSIONALS/PRACTICAL PAPER**

### **PROJECT -I(DML-504S)**

#### **GENERAL GUIDELINE**

Project Work is conceived as a group work through which the spirit of team building is expected to be developed. Students will be required to carry out their Project Works in groups under supervision of a lecturer of their core discipline who will work as a Project Guide. It is expected that most of the lecturers of the core discipline will act as project guide and each should supervise the work of at least two groups. Number of students per group will vary with the number of lecturers acting as Project Guide and student strength of that particular class.

### **HAEMATOLOGY & BODY FLUID LAB(DML-505S)**

#### **Detail contents:**

##### **1. Blood**

- 1.1 Collection of Blood
- 1.2 Separation of whole blood plasma & cells by centrifugations

- 1.3 Preparation of serum in clotting blood.
- 1.4 Haematocrit value.
- 1.5 Separation of RBC & plasma & their ratio by Wintrobe tube with the help of centrifuge
- 1.6 Preparations of blood film & staining for DC
- 1.7 Determinations of erythrocyte-sedimentation rate (ESR)
- 1.8 Haemoglobin estimation by Shalis method and colorimetric method.
- 1.9 Study of RBC, WBC & platelet.
- 2. Application of Stain**
- 2.1 Haematoxyline
- 2.2 Eosin
- 2.3 Lishman
- 2.4 Gram's stain
- 2.5 Methylene blue stain

## **BIOMEDICAL INSTRUMENTATION-III LAB(DML-506S)**

### **Detail contents:**

1. Recording procedure of Electro-cardiography.
2. Performing ECG in different physiological condition.
3. Recording procedure of EEG and Analysis of ECG wave form.
4. Recording procedure of X-ray.
5. Analysis of different X-ray performed in different body parts.
6. Observation of recording procedure of Endoscope.
7. Observation of recording procedure of MRI.
8. Application of defibrillator and analysis of its performance.
9. Layout & application of ICCU
10. Layout & application of central monitoring system
11. Working procedure of Haemodialysis (Artificial Kidney)
12. Measurement of oxygen tension in the blood by oximetry.

### **Reference Books:**

1. Marriott's Practical ECG by Wagner
2. Practical Hints to clinical ECG by C R Maiti
3. Colour Doppler imaging – S K Bargava
4. General Ultra Sound – Mittelsteadt
5. Hand book of Biomedical Instrumentation by R S Khandpur
6. Bio-medical instrumentation & measurement – Cromwell
7. Medical Electronics – D Jenning.

### **Radiology:**

8. X-ray equipments for students Radiographics – DN & Mochesney
9. Text Book of Radiology for Technician – S K Bhagava.

---

## **IMMUNOLOGY LAB(DML-507S)**

### **Detail contents:**

1. Raising antibody in animal.
  2. Characterization of antibody.
  3. Separation of lymphocytes from mouse thymus gland.
  4. Study of B-lymphocytes & T- lymphocytes.
  5. Ab-Ag reaction by common agglutination method.
  6. Optimization of Ab-Ag reaction.
  7. Detection of AIDS, immunodisorders by agglutination & other immunoassay method.
  8. Detection of antibody by agglutination assay.
- 

## **MODERN MEDICAL DIAGNOSTICS LAB(DML-508S)**

### **MODERN MEDICAL DIAGNOSTICS LAB**

#### **Detail contents:**

1. Detection of proteins by SDS-PAGE.
2. Confirmation of protein structure by SDS-PAGE.
3. Immuno dot blot analysis for both qualitative & quantitative analysis of protein.
4. Detection of protein stability & nature by spectroscopy techniques.

### **INDUSTRIAL TRAINING**

**DIT-500S**, Total Marks : 100, credit : 2

All the students must undergo at least 2 weeks Industrial training to local / outside company /organisation after completion of 4<sup>th</sup> semester examination .

A feedback form will be taken from the respective industry which will indicate the students performance during the training and same will be reflected on the grade card of 5<sup>th</sup> semester.

## 6<sup>TH</sup> SEMESTER

### PROFESSIONAL ETHICS & VALUES (DHU-601) 1<sup>st</sup> half

Total Marks: 50, Credit: 2 , CPW : 2

#### DETAIL COURSE CONTENT

##### **Effects of Technological Growth:**

Rapid Technological growth and depletion of resources. Reports of the Club of Rome. Limits to growth; sustainable development. Energy Crisis; Renewable Energy Resources. Environmental degradation and pollution. Eco-friendly Technologies. Environmental Regulations. Environmental Ethics. Appropriate Technology Movement of Schumacher: later developments. Technology and developing nations. Problems of Technology transfer. Technology assessment/ impact analysis; Industrial hazards and safety, safety regulations safety engineering. Politics and technology, authorization versus democratic control of technology; Human Operator in Engineering projects and industries. Problems of man machine interaction. Impact of assembly line and automation. Human centered Technology

##### **Ethics of Profession:**

Engineering profession: Ethical issues in engineering practice. Conflicts between business demands and professional ideals. Social and ethical Responsibilities of Technologists. Codes of professional ethics. Whistle blowing and beyond. Case studies.

##### **Profession and Human Values :**

Value Crisis in contemporary society. Nature of values: Value Spectrum of a 'good' life  
Psychological values: Integrated personality; mental health. Societal values: The modern search for a 'good' society, justice, democracy, secularism, rule of law; values in Indian Constitution. Aesthetic values: Perception and enjoyment of beauty, simplicity, clarity  
Moral and ethical values: Nature of moral judgments; canons of ethics; Ethics of virtue; ethics of duty; ethics of responsibility. Work ethics, professional ethics.

##### **REFERENCE BOOKS:**

1. Blending the best of the East & West, Dr. Subir Chowdhury, EXCEL
2. Ethics & Mgmt. & Indian Ethos, Ghosh, VIKAS
3. Business Ethics, Pherwani, EPH
4. Ethics, Indian Ethos & Mgmt., Balachandran, Raja, Nair, Shroff Publishers
5. Business Ethics: concept and cases, Velasquez, Pearson

**OPTIMIZATION TECHNIQUE**  
(DHU 601) 2<sup>nd</sup> half, Total Marks: 50, Credit: 2 , CPW : 2

Introduction to Operation Research & Optimization technique

**Linear Programming :**

Introduction to linear programming, Formulation, LPP in the standard form, LPP in canonical form, conversion of LPP in standard form to canonical form, procedure of solving LPP by graphical method.

**Introduction to Simplex method, Simplex algorithm.**

Shortest path **DJKstra** method.

**Project Scheduling :**

Project scheduling by PERT/ CPM, Decisions and game theory,

**Classical optimization theory**, unconstrained External problem.

**DML-601**  
**1<sup>ST</sup> HALF**  
**SEROLOGY, BIOPSY & ANIMAL CARE**

**GROUP-A**

**1.0 Serology:**

- 1.1 Definition
- 1.2 VDRR
- 1.3 Widal Test
- 1.4 Latex Fixation Test
- 1.5 Australian Antigen
- 1.6 Elisa Test
- 1.7 RIA

**GROUP-B**

## **2.0 Biopsy:**

- 3.1 Definition
- 3.2 Types of biopsy
- 3.3 Preparation of biopsy material
- 3.4 Embedding bath
- 3.5 Microtome
- 3.6 Sectioning
- 3.7 Staining biopsy materials.

## **3.0 Animal Care:**

- 4.1 Common laboratory animal
- 4.2 General knowledge about their food, housing, breeding, handling.

### **Reference Books:**

1. Immunology: Introductory Text Book- Nandini Shetty
2. Immunology- Kuby
3. Immunodiagnosics- S.C.Rastogi
4. Medical Laboratory Technology- Kolhatkar
5. Medical Laboratory Technology- Ramnik Sood
6. Text Book of Pathology- Harsh Mohan
7. Recent advances in pathology- K.P.Deodhar & Ulwaghlikar
8. Practical Pathology- P.Chakraborty & Gargi Chakraborty

-----

## **2<sup>ND</sup> HALF**

### **PROTEIN TECHNOLOGY(DML-601)**

#### **MODULAR DIVISION OF SYLLABUS**

(These technological studies should be very preliminary as per Diploma standard)

#### **GROUP-A**

#### **MODULE**

##### **1. Structures of protein:**

- 1.1 Study of structures (1<sup>0</sup>, 2<sup>0</sup>, 3<sup>0</sup>) of proteins
- 1.2 Protein folding

1.3 Protein stability

1.4 Storage of proteins

**2. Monoclonal antibody:**

2.1 Monoclonal and polyclonal antibody

2.2 Development of monoclonal and polyclonal antibody

2.3 Purification and storage of these antibodies

2.4 Therapeutic application of monoclonal and polyclonal antibody

**3. Analysis of protein:**

3.1 SDS-PAGE

3.2 IEF

3.3 Immunodiffusion

3.4 Western blotting

**GROUP-B**

**4. Extraction of protein:**

4.1 Precipitation

4.2 Cell destruction

4.3 Salt extraction

4.4 Solvent extraction

**5. Purification of protein:**

5.1 Gel filtration chromatography

5.2 Affinity chromatography

5.3 Dialysis

5.4 HPLC

**6. Protein Therapeutics:** (Study with their production, storage and medical application.)

6.1 Blood products

6.2 Therapeutic antibody

6.3 Therapeutic enzymes

6.4 Hormones & growth factors

6.5 Interferon

**Reference Books:**

1. Immunology: Introductory Text Book- Nandini Shetty

2. Immunology- Kuby

3. Immunology- A Short Text Book- Md. Akram Hossain

4. Immunodiagnosics- S.C.Rastogi

5. Lehninger's Principles of Biochemistry-Fourth Edition

6. Harper's Illustrated Biochemistry, 26<sup>th</sup> Edition

7. Biochemistry- Debajyoti Das

8. Basic separation Techniques in Biochemistry- R.O.Okotore

-----



# CELL AND MOLECULAR BIOLOGY (DML-602)

## 1<sup>ST</sup> HALF

### 1. Nucleic Acids:

- 1.1 Study of proteins and amino acids
- 1.2 Study of DNA
- 1.3 Study of RNA and transcription
- 1.4 DNA replication

### 2. Stability analysis of nucleic acids:

- 2.1 Isolation of DNA and its stability analysis
- 2.2 Isolation of RNA and its stability analysis

### 3. Molecular enzymes:

- 3.1 DNA modifying enzymes
- 3.2 RNA modifying enzymes

### 4. Genetic events:

- 4.1 Eukaryotic cell cycle
- 4.2 DNA repair
- 4.3 RNA transcription
- 4.4 Reverse transcription
- 4.5 Translation
- 4.6 Genetic code

## 2<sup>ND</sup> HALF

### 5. Modification of Nucleic Acids:

- 5.1 Ligation
- 5.2 Restriction digestion
- 5.3 Polymerization
- 5.4 Mutation
- 5.5 Recombinant DNA

### 6. Identification of Nucleic Acids:

- 6.1 PCR
- 6.2 DNA sequencing-Sanger method

**7. Vaccines:**

- 7.1 Study in brief about DNA vaccines
- 7.2. Study in brief about RNA vaccines

**8.** Study of Gene therapy in brief with application.

**Reference Books:**

- 1. Cell and Molecular Biology- S.C.Rastogi
- 2. Biochemistry- Debajyoti Das
- 3. Immunology: Introductory Text Book- Nandini Shetty
- 4. Human Physiology: Vol-1- Dr.C.C.Chatterjee
- 5. Immunology- Kuby
- 6. Lehninger's Principles of Biochemistry-Fourth Edition
- 7. Harper's Illustrated Biochemistry, 26<sup>th</sup> Edition
- 8. Modern Concept of Biotechnology- H.D.Kumar

-----

**ELECTIVE PAPER- DML-603/1:**  
**QUALITY CONTROL**

**1<sup>ST</sup> HALF**

**1. Data analysis**

1.1 Mean, Median, Mode and Standard deviation- related problems

**2. Optimization of results**

2.1 Correlation- Co-efficient correlation (Karl- Pearson Method), rank correlation and standard error- related problems.

2.2 Regression- Lines of regression, equation of lines of regression- related problems

2.3 Probability- Theorem of total probability (or Addition Law Probability), Theorem of compound probability (or Multiplication Law Probability).

2.4 Mean, median, standard deviation and moment of Binomial Distribution and Normal Distribution.

**3.** Clinical leverage strategy in accelerating product quality.

**4.** Development & approval of biologicals.

**5.** Storage of protein therapeutics and diagnostics.

**2<sup>ND</sup> HALF**

**6.** Quality control of protein therapeutics & diagnostics.

7. Analytical techniques used for quality control of protein therapeutics & diagnostics  
(All basic preliminary studies only can be carried over in this topic)-
- a. Spectroscopy
  - b. SDS-PAGE
  - c. Agarose gel electrophoresis
  - d. Chromatography-
    - i. Gel filtration
    - ii. Affinity
    - iii. HPLC
    - iv. ELISA
    - v. TLC

**Reference Books:**

1. Immunology-Kuby
2. Biochemistry- Debajyoti Das
3. Immunology: Introductory Text Book- Nandini Shetty
4. Basic Separation Technique in Biochemistry- R.O.Okotore
5. Books of Engineering Mathematics

-----  
-----

**ELECTIVE PAPER- DML-603/2:**  
**MEDICAL INFORMATICS**

**1<sup>ST</sup> HALF**

1. Hospital Information System – their function and state.
2. Computer based patient records
3. Informatics and clinical imaging
4. Computer networks in Health Care

**2<sup>ND</sup> HALF**

5. Overview of standards related to the emerging health care information infrastructure
6. Non-AI Decision maker.
7. Design issue in developing clinical decision support and monitoring system.

## **MEDICAL LABORATORY TECHNOLOGY PROJECT WORK II**

### **MEDICAL LABORATORY TECHNOLOGY PROJECT WORK (DML-604S)**

#### **OBJECTIVE**

**Project Work** is intended to provide opportunity for students to develop understanding of the interrelationship between different courses learnt in the entire diploma programme and to apply the knowledge gained in a way that enables them to develop & demonstrate higher order skills. The basic objective of a project class would be to ignite the potential of students' creative ability by enabling them to develop something which has social relevance, aging, it should provide a taste of real life problem that a diploma-holder may encounter as a professional. It will be appreciated if the polytechnics develop interaction with local industry and local developmental agencies viz. different *Panchayet* bodies, the municipalities etc. for choosing topics of projects and / or for case study. The course further includes preparation of a Project Report which, among other things, consists of technical description of the project. The Report should be submitted in two copies, one to be retained in the library of the institute. The Report needs to be prepared in computer using Word and CADD software wherever necessary.

#### **THE PROJECT**

This Project should cover the construction of small equipment used in the field of medical technology.

#### **BOOKS:**

1. Test Book of Pathology, Microbiology – NSDAs & T K Dey
2. Parasitology – N C Das, T K Dey
3. Parasitology – K D Chatterjee
4. Bactical Pathology – N C Das & T K Dey
5. Bacteriology – Fare Boother
6. Practical & Clinical Immunology – 6P Talwar & S K Gupta
7. Medical Parasitology & Clinical Pathology – S K Sarkar
8. Practical Pathology – T N Bhattacharya
9. Pathology – Boyd
10. Practical Pathology – P Chakraborty & Gargi Chakraborty.

---

## **SEROLOGY, BIOPSY & ANIMAL CARE LAB (DML-605S)**

Detail contents:

1. Widal test
2. VDRL assay
3. Latex fixation test
4. Detection of Australian antigen

5. ELISA for detection of various proteins (antibody & antigen)
6. Sectioning of tissue samples ( Biopsy)
7. Staining and processing of tissue samples
8. Observation of tissue samples for diagnostics purpose
9. Animal care and raising antibody in mice, rabbits.

---

## **PROTEIN TECHNOLOGY LAB(DML-606S)**

### **Detail contents:**

1. Extraction of therapeutic proteins by various methods
2. Purification of those proteins by dialysis and different types of chromatographic techniques.
3. Confirmation of stage of purification by Spectrophotometry, SDS-PAGE
4. Detection of different therapeutic proteins in various types of diseases like myeloma, leukemia, anaemia, thelaseemia etc.
5. Study of antibody, other therapeutic proteins and growth factors for therapy and diagnostics purpose.
6. Analysis of different protein therapeutics for its stability and quality.

## **Elective lab QUALITY CONTROL LAB(DML-607/1S)**

### **Detail contents:**

1. Optimization of UV absorption result.
2. Purification of proteins in different methods like- i. Gel filtration ii. Affinity iii. HPLC iv. ELISA v. TLC
3. Storage of protein therapeutics.
4. Accelerated stability testing of protein therapeutics.
5. Steps of quality control of protein therapeutics

Elective Lab

## **MEDICAL INFORMATICS LAB(DML-607/2S)**

The practical classes on this subject will be based on the computer based medical information system.

## **GENERIC SKILL(DHU-600S)**

Total Marks : 50, Credit : 1, CPW : 2

### **DETAIL COURSE CONTENT**

**Each class may be divided into two groups. Each group may meet once a week and discuss topics mentioned below under.**

**Professionalism: Professional characteristics, professional education, professional development in Industry.**

**Values and Ethics in Profession: Value system- goodness, means and ends; Ethics-ethical premises, expectations, conflicts and practices; Moral and ego, Ethics and morality.**

**Right, virtue, ethics and justice, utility and justice; Privacy, Challenges to privacy, Privacy on the Internet.**

**Professional Competence: Important technical topics covered in Semesters II-V as well as topics of current professional interest.**

#### **Books:**

- 1. Ethics and Engineering ----by Martin and Schinizer, TMC.**
- 2. Issues and Ethics—by Correy G.Correy , Brooks & Cole Pub.**
- 3. Ethics and Professionalism ---by John Kultgen**
- 4. Ethics and the conduct of business-- by John R.Boatright, PE.**

FINAL V I V A (DML-608S)

Total Marks : 50 , credit :1

DETAIL COURSE CONTENT

**The syllabi of all the theoretical and Sessional subjects taught in the 6 Semesters of diploma education.**

\*\*\*\*\*