

**DISCIPLINE SPECIFIC ELECTIVE COURSE -(BIOMED-DSE-1) MEDICAL LABORATORY TECHNOLOGY**

**CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE**

Course title & Code	Cred its	Credit distribution of the course			Eligibility criteri a	Pre-requisite of the course
		Lect ure	Tuto rial	Practical /Practice		
Medical Lab Technology	4	3	-	1	XII Pass with Physics, Chemistry & biology	Basic knowledge of biology

**Learning objective**

- The course on Medical Lab Technology would enable students to have an in-depth understanding of key concepts required in Clinical Laboratory set-ups.
- Students would be precisely trained to assist Physicians, in Laboratory set-ups and Hospitals, in handling samples, centrifuging, making slides, using specified stains etc, under proper guidance.
- After completion of the course, students would have an opportunity to work as research fellows in molecular diagnostics, molecular biotechnology companies and in research labs.

**Learning outcomes**

At the end of the course student would be able to:

- Develop specific laboratory skills, such as accurate pipetting, mixing, filtration, dispensing etc. using multi-step methods.
- Learn about ethics of working in biomedical labs and concerns about the medico legal aspects in Medical Laboratory Science.

- Comply with laboratory safety regulations and standards. Analyze and appreciate the quantum of biomedical waste that is generated and managed in various Labs.
- Exhibit skills essential to identify and determine blood group incompatibility. These skills would help them to analyze any mismatch during the blood transfusion reactions.

## **SYLLABUS**

### **Unit 1: Clinical laboratory- Basic Principal and Procedure (06 hrs)**

Standardized clinical lab setup, Lab safety and First-aid measures, Laboratory Calculations. Definition of Biomedical Waste: Types of waste generated from Health Care Facility, Segregation, Collection, Transportation, Treatment, and Disposal (including color coding) of biomedical waste. Medical Ethics - Definition - Goal - Scope, Autonomy and informed consent - Right of patients, Obtaining an informed consent, Ethics in the profession of Medical Laboratory Science.

### **Unit II: Classical Instruments and Automation used in Medical Laboratory (09 hrs)**

Working Principle of: Distillation setup, RO system, Weighing balance, Centrifuge, Bio safety cabinet, Spectrophotometer – Visible and UV-Visible, Water bath, Incubators, Hot Air Oven, Vortex mixer, Magnetic stirrer, Autoclave, Automation in clinical labs.

### **Unit-III: Clinical Biochemistry (10 hrs)**

Organ Function Tests: Liver Function Tests, Renal Function Tests, Thyroid function tests and Pancreatic Function tests, Cardiac Profile, Diabetic Profile: Regulation of Blood Glucose, FBS, PP, Glucose tolerance test (GTT), Glycosylated Hemoglobin (HbA1C), Microalbuminuria etc. Gonadal Hormonal Profile: FSH, LH, Testosterone, Estradiol.

### **Unit-IV: Clinical Hematology (8 hrs)**

Anticoagulants: Mechanism of action and Selection of anticoagulant- Wintrobe's mixture, EDTA, Heparin, Citrate, ACD. Erythropoiesis and Thrombopoiesis. Synthesis of hemoglobin and iron metabolism. Anemia: Definition, Causes, Classification & lab findings of Iron Deficiency Anemia,

Megaloblastic Anemia, Hemolytic Anemia. Hemoglobinopathies: Hemophilia, Thalassemia, Sickle cell anemia. Leukemia: Classification, Blood Picture, Differentiation of Blast Cells. Hematological tests- CBC, Fetal hemoglobin test, Osmotic fragility test, Serum iron, TIBC. Blood groups-RH and ABO system. Blood transfusion: Prerequisites of transfusion.

**Unit-V: Body Fluid Examination** **(04 hrs)**

Urine examination: Physical, Chemical, Microscopic and Culture. Routine examination of faeces. Examination of body fluids, Cell counts, Semen analysis, CSF (Cerebrospinal Fluid), Chemical Tests of Gastric Content, Collection and Transportation of specimens: General Principles, Containers, Rejection, Samples- Urine, Faeces, Sputum, Pus, Body fluids, Swab, Blood.

**Unit-VI: Diagnostic Cytology and Molecular Biology** **(08 hrs)**

Normal chromosomal structure, Pre and Post-natal Cytogenetics, Cancer and Tumor markers-FISH. Aspiration Cytology: Principles, Indications, Fine Needle Aspiration Cytology (FNAC) and Fluid cytology. Exfoliative cytology: Introduction, Preparation of vaginal & cervical smears, Papanicolaou technique for the staining of cervical smears (PAP smear). Histopathology: HE staining and IHC. Role of molecular biology in diagnostics, Common techniques used in molecular biology for the detection of infectious and non-infectious disease-PCR and its variants. Stem cell banking: Applications, Procedure & Requirements of cord blood cells.

**Practical:**

(Wherever wet lab experiments are not possible the principles and concepts can be demonstrated through any other material or medium including videos/virtual labs etc.)

1. Preparation of reagents routinely used in Medical Laboratories.
2. Standardization of 1.0 ml of volumetric pipette.
3. Working of various instruments used in Medical laboratory: Water baths, Incubators & Hot Air Oven, Centrifuges, Balances, Autoclave, pH Meter, Vortex mixer and magnetic stirrer. Maintenance of working manuals provided with the Instruments, formulating SOPs and LOG Books for each of the Instruments.
4. Calibration and standardization of spectrophotometer and other Instruments.

5. Selection of a filter for determining the intensity of a coloured solution.
6. Determination of an unknown concentration of a coloured solution by photometric method.
7. Organize a poster making competition for standard biomedical waste disposal procedure.
8. Medico legal experts maybe invited to deliver lecture on specific topics and share their experiences.
9. Visit to hospital for demonstration of Biomedical Waste Management.
10. Visit to hospital for demonstration of advanced instrumentation and auto-analyzers.

#### **Essential Reading:**

- Sood Ramnik. (2006). Textbook of Medical Laboratory Technology. *1<sup>st</sup> edition*. Jaypee Brothers Medical Publishers. ISBN: 978-8180615917.
- Dacie and Lewis. (2017). *Practical Hematology*. *12<sup>th</sup> edition*. Elsevier IE. ISBN: 978-0702069307.

#### **Suggested Reading:**

- Devlin, T.M. (2011). *Textbook of Biochemistry with Clinical Correlations*. *7<sup>th</sup> edition*. John Wiley & Sons, Inc. (New York). ISBN: 978-0-470-28173-4.
- R. S Khandpur. (2014). *Handbook of Biomedical Instrumentation*. *3<sup>rd</sup> edition*. McGraw-Hill Education ISBN 978-9339205430.
- Mary C. Haven, Gregory A. Tetrault, Jerald R. Schenke. (2010). *Laboratory Instrumentation*. *4<sup>th</sup> edition*. Wiley India Pvt Ltd. ISBN 978-8126528578.