

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN BIOMEDICAL ENGINEERING

Semester: 4

Subject Name ANALYTICAL & OPTICAL INSTRUMENTATION

Sr.No	Course content
1.	INTRODUCTION TO VARIOUS BRANCHES OF ANALYTICAL LABS / CLINICAL LABS 1.1 Recording and measuring techniques, 1.2 Technical Specifications
2.	BLOOD GAS ANALYZER: 2.1 pH electrode, 2.1.1 Specifications, working principle, schematic diagram 2.2 pO ₂ electrode, 2.2.1 Specifications, working principle, schematic diagram 2.3 pCO ₂ electrode 2.3.1 Specifications, working principle, schematic diagram
3.	OPTICAL EQUIPMENTS 3.1 Glucometer 3.1.1 Working principle and Block diagram 3.1.2 Applications 3.2 Colorimeter 3.2.1 Specifications and critical parameters 3.2.2 Working principle and Block diagrams 3.2.3 Different types of light sources , optical filters, monochromators 3.3 Spectrophotometer 3.3.1 Specifications and critical parameters 3.3.2. Working principle and block diagram of spectrophotometer 3.3.3 Various blocks - Light source - Diffraction grating monochromators - Photodiodes - Instrumentation amplifiers - A/D conversion and display section 3.4 Flame photometer 3.4.1 Specifications and critical parameters 3.4.2 Working principle and Block diagram of flame photometer 3.4.3 Various blocks - Air compressor - LPG connection - Atomizer - Optical filter - Photo-detectors, etc. 3.4.4. Practical applications for Na ⁺ , K ⁺ , and Li ⁺ , concentration in the given blood sample 3.5 ELISA Reader 3.5.1 Working principle and Block diagram 3.5.2 Applications

	3.6 Autoanalyser 3.6.1 Introduction to auto-analyzer and its types 3.6.2 Specifications and critical parameters 3.6.3 Working principle and Block-diagram of auto-analyzer 3.6.4 various blocks -sampler -pumps -mixer -heater -dialyzer -colorimeter -recorder and digital printer etc. 3.6.5 Practical applications of auto-analyzer
4.	ELECTROPHORESIS & CHROMATOGRAPHY EQUIPMENT 4.1 Working principle and Block /Flow diagram 4.2 Applications
5.	MICROSCOPY EQUIPMENTS: 5.1 Microscope: Working principle, Block diagram, applications 5.2 Electronic microscope: Working principle, Block diagram, applications.
6.	OPHTHALMIC INSTRUMENTS: 6.1 Ophthalmoscope 6.1.1 Working principle and its applications 6.2 Tonometer 6.2.1 Working principle and its applications
7.	BLOOD CELL COUNTERS: 7.1 Specifications and critical parameters 7.2 Methods of blood cell counting – a) Microscopic method, b) Optical method c) Electrical conductivity method, 7.3 coulter counters: Working principle, Block diagram, construction applications
8.	LAB EQUIPMENT: working principle and Applications of 8.1 Centrifuge, 8.2 Ultra-centrifuge 8.3 Ultrasound cleaner 8.4 Freezer and deep freezer.
9.	STERILIZER EQUIPMENT: working principle and Applications of 9.1 Hot air oven 9.2 Auto clave (vertical /horizontal) 9.3 water bath and Incinerator

LABORATORY EXPERIENCES :

Sr.	Name of Experiments
1	To demonstrate the working principle of pH meter
2	To demonstrate the working principle of Colorimeter
3	To demonstrate the working principle of Spectrophotometer
4	To demonstrate the working principle of Flame photometer
5	To demonstrate the working principle of Electrophoresis
6	To demonstrate the working principle of Centrifuges
7	To demonstrate the working principle of Hot air oven
8	To demonstrate the working principle of Freezer
9	To demonstrate the working principle of Autoclave
10	To demonstrate the working principle of <u>ELISA Reader</u>
11	To demonstrate the working principle of <u>Ultrasound cleaner</u>
12	To demonstrate the working principle of <u>Blood cell counters</u>
13	To demonstrate the working principle of <u>Tonometer</u>
14	To demonstrate the working principle of <u>Ophthalmoscope</u>
15	To demonstrate the working principle of <u>Microscope</u>
16	To demonstrate the working principle of <u>Electrophoresis</u>
17	To demonstrate the working principle of <u>chromatography</u>
18	To demonstrate the working principle of Auto analyzer
19	To demonstrate the working principle of <u>Glucometer</u>

REFERENCES BOOKS:

1. Handbook of Biomedical Instrumentation by R. S. Khandpur, PUB Tata McGraw Hill
2. Medical Electronics by A.G. Patil, PUB: Excel Book New Delhi
3. Biomedical instrumentation & measurements by Lesli P Cromwell, Fred J. Weibell, Erich A. Pfeiffer ,PUB : Prentice Hall of India
4. Introduction to Biomedical Equipment Technology by Carr Joseph J., Brown J.M , PUB: Pearson Education Delhi
5. Medical Instrumentation application & design by John G. Webster, Editor, Pub: John Wiley and Sons (Asia) Ltd