

Department of Zoology (M.Sc.I)

- 1) **Title of the course:** Certificate course in Bio-instrumentation Science
- 2) **Year of Implementation:**2018
- 3) **Preamble of the syllabus:** The basic objective of this course is to provide information regarding Modern analytical tools used in life sciences as well as This course is introduced to bridge the gap between academics and industry.The number of conventional and modern analytical techniques along with their principle, instrumentation and applications are included in the course.
- 4) **Eligibility:** XII
- 5) **Examination:** Internal and end of the year examination with a..... A) Pattern of examination: i) Internal and end of the year examination with a weightage of respectively. There are theory courses and practical courses. Internal exam will consist of (written test and orals.)
ii) **Pattern of the question paper: Annual.**

Laboratory Safety-

Safety in the Laboratory Should always is in your mind. Throughout this manual Safety recommendations are given, below are some general consideration that anyone in a laboratory should know.

General laboratory safety precaution.

- Follow all instructions carefully. Use special care when you see the word CAUTION in your laboratory instructions. Follow the safety instructions given by your teacher.
- Determine the location of Fire Extinguishers, Chemical safety showers and Eye washers, Chemical Spill Kits, and alternative exit routes for lab evacuation.
- Remember that smoking, eating, or drinking in the lab room is totally prohibited.
- Wear lab aprons when working with chemicals, hot material, or preserved specimens. Any chemicals spilled on the hands or other parts of the skin should be washed off immediately with a plenty of running water.
- Never work alone in the laboratory.
- Keep your work area clean & dry.
- Turn of all electrical equipment, water, and gas when it is not in use, especially at the end of the laboratory period.
- Tie back long hair.

CZT 101: Biomolecules and their applications of instruments
CZL102: Lab practical's
CZP 103: Project work

CZT 101Biomolecules &their applications of instruments

Total-48 hrs

UNIT-1: Bio molecules-12 Hrs

- 1) The molecular logic of life: The chemical unity of diverse living organisms, composition of living matter. Concept of thermodynamics and Properties of water
- 2) Bio molecules: Carbohydrate, Amino acid, Protein, Lipid, Vitamins co-enzymes
- 3) Enzyme structure, Classification, Mechanism of action
- 4) Carbohydrate Metabolism: Biochemistry of Hormone Insulin and glucagon action

Learning outcomes –

- The student will be able to get knowledge of molecules of life.
- He will be able to understand the role of carbohydrates, fats, proteins, vitamins and their metabolic activities.

UNIT 2- Biostatistics 12 Hrs

- 1) Introduction and application of Biostatistics, Probability
- 2) Measurement of central tendency, Measures of Dispersion,
- 3) Correlation: Types and methods of correlation, Testing hypothesis, Null hypothesis
- 5) Analysis of Variance (ANOVA)

Learning outcomes-

- The student will encompass the methodology and theory of statistics applied to problems in the life and health sciences.
- They will be able to understand and apply statistical methods in their research.

UNIT-3 Cell and Histology

12 hrs

- 1) Fundamentals of histology: Tissue structure structures and their organization, Cell membrane, cell organelle and Marker Bio molecules
- 2) Microscopy: Light microscope, Phase contrast microscope, Scanning electron microscope, Transmission
- 3) Electron microscope
- 3) Preparation Of slide: Fixatives Types and choice, Sample preparation, Microtome
- 4) Stains: Methods tools and techniques for tissue staining, Principles of histochemical reactions Staining and visualization of a) carbohydrates b) proteins c) lipids d) Nucleic acid

Learning outcomes-

- Students will be able to identify the basic structure of cells, tissues and organs .
- They will be able to interpret histological images and identify the tissue source and structures

UNIT 4 - Molecular biology and genetic engineering

12 hrs

- 1) **Nucleic Acid:** Structure and biochemistry of nucleic acid, Central dogma of molecular biology (Replication, transcription, Translation) Process of Mitosis and meiosis.
- 2) **Genetic Engineering-** Vector, Plasmid, Ti-plasmid, Restriction Endonucleases, Exonucleases, Antibiotic resistance transfer by plasmid
- 3) **Modern tools and technique used in Taxonomy-** DNA amplification by PCR, DNA Barcoding, DNA sequencing
- 4) **Immune System:** system overview, innate and acquired immune system. Components of immune system. B cell and T cell mediated Immune System, Antigen Antibody interaction.

Learning outcomes-

- Student will be able to understand how these molecules interact within the cell for proper growth and development of cell.
- They will be able to emphasize molecular mechanisms

CZL 102-Practical

96 hrs

- 1) Introduction to measurements: balances and pipetting.
- 2) Preparation of solutions of given normality and its standardization.
- 3) Examples based on Mean ,Median ,Mode
- 4) Examples based on Student t-test
- 5) Examples based on ANOVA
- 6) Examples based on Probability
- 7) Examples based on Correlation coefficient

- 8) Spectrophotometer: Record Absorbance of DNA and Protein at 260nm and 280nm respectively
- 9) Colorimetry: Quantitative estimation of protein by biuret test and DNA by Di-Phenyl Amine method
- 10) Buccal smear – Identification of Barr Body
- 11) Tissue fixation, Processing and sectioning using Microtome
- 12) Staining and permanent slide preparation.
- 13) Detection of carbohydrates/ Lipids/ mucopolysaccharides/nucleic acids /proteins
- 14) Isolation of Genomic DNA from Liver
- 15) Qualitative Analysis of DNA with the help of Agarose gel electrophoresis
- 16) Demonstration of PCR
- 17) Demonstration of blotting techniques.
- 18) Practicals related to use of microscopes
- 19) Immunoprecipitation
- 20) ELISA Technique

CZP 103 – Projects related to subject

24 hrs

Recommended Books:

1. Biochemistry, L Stryer, Freeman and Co, NY
2. Biochemistry, Zubay, Addison Wesley and Co.
3. Textbook of Physiology, Guyton
4. Practical Biochemistry: Principles and techniques: K. Wilson and J. Walker.
5. Practical Biochemistry by David Plummer
6. Introductory Practical Biochemistry by S.K. Sawhney and R.Singh
7. Principles of Biochemistry, Lehninger C Rs. Publ. (1982).
8. Biochemistry, L. Stryer, W.H. Freeman, San Francisco.
9. Biochemistry by Voet and voet
10. Biochemistry by Zubay
11. Color Textbook of Histology Textbook by LESLIE P GARTNER