

DEPARTMENT OF CLINICAL BIOCHEMISTRY, UNIVERSITY OF KASHMIR  
SYLLABUS FOR INTEGRATED PH. D PROGRAM COURSE WORK

Paper, I Research Methodology (CLB IPHD-01)

**Unit I - Research design and types**

Purpose and motivation in research, Importance of bibliography and Review of literature in research. Types of information sources – primary and secondary sources, Identifying research gaps/areas from literature review. Selection and identification of the research problem. Design and identification of principle objectives, hypothesis and aim of research. Criterion of a good research proposal. Research methods used in social settings- including experimental, quasi- experimental and qualitative methods. Elements of reliable and valid research, reduction of bias research.

**Unit II - Research Ethics**

Definition and Objectives of research ethics, academic honesty, types of ethical issues in research, codes and policies for research ethics, criteria and principles for good research practice, Scientific misconducts – Falsification, Fabrication and Plagiarism, Plagiarism policies & types - penalties and consequences, detection of plagiarism by using different online tools, Publication ethics- definition and importance, conflicts of interest; publication misconduct – definition, concept and problems leading to unethetical behavior, Violation of publication ethics, authorship and contributorship; procedures and ethical principles of guiding research, guidelines for the ethical conduct in the animal use and welfare, ethical issues in methodology of clinical research, laboratory safety and management of laboratory wastes.

**Unit III- Statistics in research**

Significance of statistics in biological research, Concepts of data, Tools for data collection, Pilot Studies and Pre-tests, Statistical approaches and significance- Probability, Binomial distribution, Poisson distribution, Normal distribution, Regression and Correlation Analysis, Test of Significance- Chi-Square test, T-test and F-test, Sampling Techniques or Methods- Choice of Sampling Techniques, Sample Size, Sampling and Non-Sampling Errors, Correlation and regression analysis, Knowledge of ANOVA, SPSS and STATA soft wares and their applications.

**Unit IV- Techniques employed in Clinical Biochemistry**

Techniques for DNA and RNA isolation, Gene cloning, screening and selection of recombinant clones, RFLP, RAPD analysis, PCR and its types, Site directed mutagenesis, Electrophoresis - Agarose and PAGE, Isoelectric focusing, Blotting techniques (Western, Northern and Southern blotting), PCR and its types, ELISA and its types, Microscopy – preparation and processing of samples, Types of microscopy-Compound microscope, Electron microscope and Fluorescence Microscope)

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## Paper II Advances in Clinical Biochemistry (CLB IPHD-02)

### **Unit-I- Molecular Diagnostics**

**Introduction** - Reverse transcriptase PCR, Quantitative real time PCR, the basic concept and threshold cycle, fluorescent dyes used in real time PCR, Taqman™, specimen collection and transportation, nucleic acids extraction, PCR optimization and inhibitors, handling contamination, applications of real time PCR as diagnostic tool. Chip based diagnostics - DNA sequence analysis, gene expression profiling, biomarker detection, their role in detection of diseases or their susceptibility, applications of chips; Molecular diagnostics of non-infectious diseases such as diabetes, metabolic syndrome, Alzheimer's and molecular markers for early detection of cancer.

### **Unit II- Automation in Clinical Biochemistry**

Types of Automation, Individual steps in the analytical processes, Reagent handling and storage, reagent delivery, Chemical reaction phase, Development of standards for laboratory automation. Other areas of automation; urine analyzers, hematology cell counters and flow-cytometers. Quality Assurance & Management: Fundamentals of total quality management, elements of quality assurance program. External quality assessment- Identifying the source of analytical errors. Fundamentals of Lab Safety. Establishment and use of reference values: Concept of reference values, Selection of reference individuals, Specimen collection, Analytical procedures and quality control. Methods for determining the reference values and presentation of an observed value in relation to reference value.

### **Unit III Laboratory diagnostics**

Blood routine examination- RBC, HGB, WBC, WBC differential count reference values and clinical significance, Differential blood cells count, significance of dysmorphic blood cells, Blood routine examination (HCT, ESR, Ret), Laboratory diagnosis of anemia, tests of anemia, the significance of relevant parameters of hematology analyzers. Lipid metabolism disorders and diseases, Changes of blood glucose in hepatic disease, Common renal function tests and their clinical significance, Clinical application of blood gas analysis and acid-base balance tests, Serum K<sup>+</sup>, Na<sup>+</sup>, Cl<sup>-</sup> tests and their clinical significance.

### **Unit IV Bioinformatics**

Role of Bioinformatics - in clinical research, drug development and vaccine development, Gene Bank, Nucleotide sequence databank, DNA data bank of Japan, protein data bases-Primary and secondary data bases, database formats, structural data bases, protein data bases, Molecular model bank, protein- protein interaction detection tools and data bases, Tools for primer designs, Citation management tools.