

**Central University of Punjab,  
Bathinda**



**Department of Human Genetics and  
Molecular Medicine**

**Session - 2019-21**

## Ph.D in Human Genetics

### Course Structure of the Programme

Course Code	Course Title	Course Type	Credit Hours		
			L	T	P
LHG.70 1	Research Methodology and Biostatistics	-	5	-	-
LHG.70 2	Advanced Human Genomics and Epigenomics	-	5	-	-
LHG.79 7	Credit Seminar	-	2	-	-
<b>Total Credits</b>			<b>12</b>	-	-

## Details of syllabus

**Course Code: LHG.701**

L	T	P	Cr
5	-	-	5

**Course Title: Research Methodology and Biostatistics**

**Total Hours: 72**

### Learning Outcomes:

On successful completion of the course the student will be able to:

- Analyze and evaluate wide variety of statistical data
- Represent statistical data and summary statistics in graphical and tabular forms
- Apply suitable statistical tools to analyze data
- Write and communicate scientific reports, projects and publications

### UNIT I

**18 Hours**

**General principles of research:** Meaning and importance of research, Critical thinking, Formulating hypothesis and development of research plan, Review of literature, Interpretation of results and discussion.

**Bibliographic index and research quality parameters:** Citation index, impact factor, h-index, i10 index etc. Research search engines: google scholar, Scopus, Web of science etc.

**Technical writing:** Technical and scientific writing: thesis, technical papers, reviews, electronic communication, research papers, etc. Poster preparation and Presentations and Dissertation. Reference management using various softwares: Endnote, reference manager, refwork, etc. Communication skills – defining communication, types of communication, techniques of communication, etc.

**Library:** Classification systems, e-Library, Reference management, Wb-based literature search engines.

### UNIT II

**18 Hours**

**Plagiarism:** Plagiarism, definition, Search engines, regulations, policies and documents/thesis/manuscripts checking through softwares, Knowing and Avoiding Plagiarism during documents/thesis/manuscripts/ scientific writing.

**Intellectual Property Rights:** Intellectual Property, intellectual property protection (IPP) and intellectual property rights (IPR), WTO (World Trade Organization), WIPO (World Intellectual Property Organization), GATT (General Agreement on Tariff and Trade), TRIPs (Trade Related Intellectual Property Rights), TRIMS (Trade Related Investment Measures) and GATS (General Agreement on Trades in Services), Nuts and Bolts of Patenting, Technology Development/Transfer Commercialization Related Aspects, Ethics and Values in IP.

### **UNIT III**

**18 Hours**

**Biostatistics:** Difference between parametric and non-parametric statistics, Univariate and multivariate analysis, Confidence interval, Errors, Levels of significance, Hypothesis testing. Measures of central tendency and dispersion, Histograms, Probability distributions (Binomial, Poisson and Normal), Sampling distribution, Kurtosis and skewness

**Comparative Statistics:** Comparing means of two or more groups: Student's t-test, Paired t-test, Mann-Whitney U-test, Wilcoxon signed-rank, One-way and two-way analysis of variance (ANOVA), Critical difference (CD), Fisher's LSD (Least significant difference), Kruskal-Wallis one-way ANOVA by ranks, Friedman two-way ANOVA by ranks, Chi-square test

**Regression and correlation:** Standard errors of regression coefficients, Comparing two regression lines, Pearson Product - Moment Correlation Coefficient, Spearman Rank correlation coefficient, Power and sampling size in correlation and regression.

### **UNIT IV**

**18 Hours**

**Fundamentals of computer:** Parts of computer, Hardware, BIOS, Operating systems, Binary system, Logic gates and Boolean algebra. Application software: Spreadsheet applications, Word-processing applications, Presentation applications, Internet browsers, Reference Management, and Image processing applications. Computer language: Basic DOS commands, AutoHotKey scripting language, HTML and basic structure of a webpage, Designing websites. World wide web: Origin and concepts, Latency and bandwidth, Searching the internet, Advanced web-search using Boolean logic, Cloud computing.

**Transactionalal Modes:** Lecture; Tutorial; Problem solving; Self-learning.

### Suggested Readings:

1. Norman, G. and Streiner, D. (2008). *Biostatistics: The Bare Essentials*. (with SPSS), 4<sup>th</sup> Edition, People's Medical Publishing House, USA.
2. Sokal, R.R. and Rohlf, F.J. (1994). *Biometry: The Principles and Practices of Statistics in Biological Research*. 4<sup>th</sup> Edition, W.H. Freeman publishers, USA.
3. Banerjee P.K (2014). *Introduction to Biostatistics*. S.Chand, India
4. Daniel WW (2010). *Biostatistics: A Foundation for Analysis in the Health Sciences*. John Wiley and Sons Inc.
5. Bailet NTJ. *Statistical Methods in Biology*. Cambridge Univ. Press.
6. Glaser AN. *High-Yield Biostatistics*. Lippincott Williams & Wilkins.
7. Gupta, S. (2008). *Research Methodology and Statistical Techniques*. Deep and Deep Publications (P) Limited, New Delhi.
8. Kothari, C. R. (2014). *Research Methodology (s)*. New Age International (p) Limited. New Delhi.
9. Sahay, Vinaya and Pradumna Singh (2009). *Encyclopedia of Research Methodology in life Sciences*. Anmol Publications. New Delhi

Course Code: **LHG.702**

L	T	P	Cr
5	-	-	5

Course Title: **Advanced Human Genomics and Epigenetics**

Total Hours: **72**

### Learning Outcomes:

On successful completion of the course the student will be able to:

- Know the basic and advanced concepts in human genomics and epigenomics
- Practice cell culture techniques to perform experiments
- Synthesise idea about the modern aspects of epigenomics
- Know in depth concepts of pharmacogenomics

### UNIT I

**18 Hours**

**Advanced Human Cytogenetics:** GTG banding and nomenclature of human chromosomes; structure of X and Y chromosomes; X and Y pairing and pseudoautosomal region; Molecular mechanism of X inactivation; Molecular cytogenetics methods: FISH, CGH, SKY; Cytogenetics of cancer.

## UNIT II

18 Hours

**Tissue culture techniques:** Whole blood culture; bone marrow culture; amniocyte culture; chorionic villi culture; skin fibroblast culture.

## UNIT III

18 Hours

**Pharmacogenomics and Overview of Human Genome Project:** Concept of individual based treatment, Drug Metabolism; Genetic makeup and Drug Response; High throughput screening for drug discovery; Identification of drug targets; Pharmacogenetics and drug development, Personalized Medicine; goals of Human Genome Project, its implications on research and human society; Strategies for genome sequencing; Early, next and third generation DNA sequencing methods; Personalized medicine.

## UNIT IV

18 Hours

**Introduction and molecular mechanisms of Epigenetics:** Mechanisms of DNA methylation; Histone modifications; Chromosomal position effect and gene variegation; Epigenetic control of gene activity; Analysis of gene-specific DNA methylation; Methods of assessing genome-wide DNA methylation; Model organism of epigenetic: *Drosophila*

**Transactionalal Modes:** Lecture; Demonstration; Tutorial; Lecture cum demonstration; Problem solving; Self-learning.

### Suggested Readings:

1. Tollefsbol T.(2011). *Handbook of Epigenetics*, Elsevier Publications
2. Carey N. (2013). *The Epigenetics Revolution: How Modern Biology Is Rewriting Our Understanding of Genetics, Disease, and Inheritance*. Columbia Univ Pr.
3. Wallach J (2014). *Epigenetics: The Death of the Genetic Theory of Disease Transmission*. Kindle Publications, Columbia University Press.
4. Francis R.C. (2012). *Epigenetics: How Environment Shapes Our Genes*. W.W. Norton and Company, New York.
5. Jocelyn, E. K., Elliot, S. G. and Stephen, T. K. (2009), *Lewin's Gene X*. Jones & Barlett.
6. Korf, B.R. (2006). *Human Genetics and Genomics*. Wiley Blackwell.
7. Lodish, H., Berk, A., Chris, A. K., Krieger, M. (2008), *Molecular Cell Biology*. W.H.Freeman, USA.

Course Code: **LHG.797**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Cr</b>
<b>2</b>	-	-	<b>2</b>

Course Title: **Credit Seminar**

Total Hours: **15**

**Learning Outcomes:**

On successful completion of the course the student will be able to:

- Improve communication aptitude
- Learn presenting paper or data in scientific forum

Credit Seminar topics will be decided jointly by PhD supervisor and the student and will be presented in open house. Seminar presentation will be followed by open discussion.

**Evaluation criteria:** The detailed assessment criteria are as per University policy. The students will be assessed based on presentation and report submitted on the topics assigned by seminar coordinator.