

CENTRAL UNIVERSITY OF PUNJAB



Ph.D in Human Genetics

Session 2021-22

**Department of Human Genetics and
Molecular Medicine**

Programme Outcome

This programme will enrich students with fundamental knowledge of research ethics, research methodology in the field of human genetics. On successful completion of this programme the students will be able to:

- Integrate multidisciplinary approaches to analyze the role of genetic and molecular factors in health and disease
- Design and perform molecular genetics and epidemiological studies for health research
- Compete at national and global level to pursue research and teaching in any field of life sciences
- Perform best practices in research in the field

Course Structure of the Programme

Ph.D in Human Genetics

Course Code	Course Title	Course Type	Hours			Credit
			L	T	P	
HGE.701	Research Methodology and Biostatistics	Core course	4	0	0	4
HGE.702	Advanced Human Genomics and Epigenetics	Core course	4	0	0	4
HGE.751	Research and Publication Ethics	Core course	4	0	0	2
HGE.752	Teaching Assistantship		0	0	2	1
UNI.753	Curriculum, Pedagogy and Evaluation		1	0	0	1
HGE.797	Credit Seminar	Skill based	4	0	0	2
TOTAL						14

Details of syllabus

Course Code: HGE.701
Course Title: Research Methodology and Biostatistics
Total Hours: 60

L	T	P	C
4	0	0	4

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

Hours: 15

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.

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.

UNIT II

Hours: 15

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

Hours: 15

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 dispersal, 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

Hours: 15

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.

Transactional Modes: Lecture; Tutorial; Problem solving; Self-learning.

Internal assessment shall be through any of the following: Surprise Tests, one sentence summary, case analysis, simulated problem solving, open book techniques, classroom assignments, homework assignments, term paper, presentations and discussions.

Suggested Readings:

1. Norman, G. and Streiner, D. (2008). Biostatistics: The Bare Essentials. (with SPSS), 4th 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. 4th 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. NewDelhi.
9. Sahay, Vinaya and Pradumna Singh (2009). Encyclopedia of Research Methodology in life Sciences. Anmol Publications. New Delhi

Course Code: HGE.702
Course Title: Advanced Human Genomics and Epigenetics
Total Hours: 60

L	T	P	C
4	0	0	4

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

Hours: 15

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

Hours: 15

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

UNIT III

Hours: 15

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

Hours: 15

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

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

Internal assessment shall be through any of the following: Surprise Tests, one sentence summary, case analysis, simulated problem solving, open book techniques, classroom assignments, homework assignments, term paper, presentations, and discussions.

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: HGE.751

Course Title: Research and Publication Ethics

L	T	P	Credits
2	0	0	2

Total Hours: 30

Unit I Philosophy and Ethics

3 hours

- Introduction to Philosophy : definition, nature and scope, content, branches
- Ethics : definition, moral philosophy, nature of moral judgements and reactions

Unit II Scientific Conduct

5 hours

- Ethics with respect to science and research
- Intellectual honesty and research integrity
- Scientific misconducts : Falsification, Fabrication, and Plagiarism (FFP)
- Redundant publications : duplicate and overlapping publications, salami slicing
- Selective reporting and misrepresentation of data

Unit III: Publication Ethics

7 hours

- Publication ethics : definition, introduction and importance
- Best practices/ standards setting initiatives and guidelines: COPE, WAME, etc.
- Conflicts of interest
- Publication misconduct : definition, concept, problems that lead to unethical behaviour and vice versa, types
- Violation of publication ethics, authorship and contributor ship
- Identification of publication misconduct, complaints and appeals
- Predatory publishers and journals

Unit IV Open Access publishing

4 hours

- Open access publications and initiatives
- SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies
- Software tool to identify predatory publication developed by SPPU
- Journal finder/journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer, Journal Suggester etc.

Unit V Publication Misconduct

4 hours

- Group Discussions: Subject specific ethical issues, FFP, authorship; conflicts of interest; complaints and appeals: examples and fraud from India and abroad
- Software tools: Use of plagiarism software like Turnitin, Urkund and other open source software tools

Unit IV Databases and Research Metrics

7 hours

- Databases: Indexing databases; Citation database: Web of Science, Scopus etc.

- Research Metrics: Impact Factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score; Metrics : h-index, g-index, i10 index, almetrics

Course Code: HGE.752

Course Title: TEACHING ASSISTANTSHIP

L	T	P	Credit
0	0	2	1

Total Hours: 30

Learning Outcome:

At the end of this skill development course, the scholars shall be able to

1. familiarize themselves with the pedagogical practices of effective class room delivery and knowledge evaluation system
2. manage large and small classes using appropriate pedagogical techniques for different types of content

Activities and Evaluation:

- The scholars shall attend Master degree classes of his/her supervisor to observe the various transaction modes that the supervisor follows in the class room delivery or transaction process one period per week.
- The scholars shall be assigned one period per week under the direct supervision of his/her supervisor to teach the Master degree students adopting appropriate teaching strategy(s).
- The scholars shall be involved in examination and evaluation system of the Master degree students such as preparation of questions, conduct of examination and preparation of results under the direction of the supervisor.
- At the end of the semester, the supervisor shall conduct an examination of teaching skills learned by the scholar as per the following evaluation criteria:
- The scholars shall be given a topic relevant to the Master degree course of the current semester as his/her specialization to prepare lessons and deliver in the class room before the master degree students for one hour (45 minutes teaching + 15 minutes interaction).
- The scholars shall be evaluated for a total of 50 marks comprising content knowledge (10 marks), explanation and demonstration skills (10 marks), communication skills (10 marks), teaching techniques employed (10 marks), and classroom interactions (10).

Course Code: UNI.753

Course Title: CURRICULUM, PEDAGOGY AND EVALUATION

L	T	P	Credit
1	0	0	1

Learning outcomes:

Total Hours: 15

After completion of the course, scholars shall be able to:

- analyze the principles and bases of curriculum design and development
- examine the processes involved in curriculum development
- develop the skills of adopting innovative pedagogies and conducting students' assessment
- develop curriculum of a specific course/programme

Course Content

Unit I Bases and Principles of Curriculum 4 hours

1. Curriculum: Concept and Principles of curriculum development, Foundations of Curriculum Development.
2. Types of Curriculum Designs- Subject centered, learner centered, experience centered and core curriculum. Designing local, national, regional and global specific curriculum. Choice Based Credit System and its implementation.

Unit II Curriculum Development 4 hours

1. Process of Curriculum Development: Formulation of graduate attributes, course/learning outcomes, content selection, organization of content and learning experiences, transaction process.
2. Comparison among Interdisciplinary, multidisciplinary and trans-disciplinary approaches to curriculum.

Unit III Curriculum and Pedagogy 3 hours

1. Conceptual understanding of Pedagogy.
2. Pedagogies: Peeragogy, Cybergogy and Heutagogy with special emphasis on Blended learning, Flipped learning, Dialogue, cooperative and collaborative learning
3. Three e- techniques: Moodle, Edmodo, Google classroom

Unit IV Learners' Assessment 4 hours

1. Assessment Preparation: Concept, purpose, and principles of preparing objective and subjective questions.
2. Conducting Assessment: Modes of conducting assessment – offline and online; use of ICT in conducting assessments.
3. Evaluation: Formative and Summative assessments, Outcome based assessment, and scoring criteria.

Transaction Mode

Lecture, dialogue, peer group discussion, workshop

Evaluation criteria

There shall be an end term evaluation of the course for 50 marks for duration of 2 hours. The course coordinator shall conduct the evaluation.

Suggested Readings

- Allyn, B., Beane, J. A., Conrad, E. P., & Samuel J. A., (1986). Curriculum Planning and Development. Boston: Allyn & Bacon.
- Brady, L. (1995). Curriculum Development. Prentice Hall: Delhi. National Council of Educational Research and Training.
- Deng, Z. (2007). Knowing the subject matter of science curriculum, Journal of Curriculum Studies, 39(5), 503-535. <https://doi.org/10.1080/00220270701305362>
- Gronlund, N. E. & Linn, R. L. (2003). Measurement and Assessment in teaching.
- Singapore: Pearson Education
- McNeil, J. D. (1990). Curriculum: A Comprehensive Introduction, London: Scott, Foreman/Little
- Nehru, R. S. S. (2015). Principles of Curriculum. New Delhi: APH Publishing Corporation.
- Oliva, P. F. (2001). Developing the curriculum (Fifth Ed.). New York, NY: Longman
- Stein, J. and Graham, C. (2014). Essentials for Blended Learning: A Standards-Based Guide. New York, NY: Routledge.

Web Resources

- https://www.westernsydney.edu.au/_data/assets/pdf_file/0004/467095/Fundamentals_of_Blended_Learning.pdf
- <https://www.uhd.edu/academics/university-college/centers-offices/teaching-learningexcellence/Pages/Principles-of-a-Flipped-Classroom.aspx>
- <http://leerwegdialoog.nl/wp-content/uploads/2018/06/180621-Article-The-BasicPrinciples-of-Dialogue-by-Renate-van-der-Veen-and-Olga-Plokhooij.pdf>

Course Code: HGE.797
Course Title: Credit Seminar
Total Hours: 30

L	T	P	C
2	0	0	2

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:

A. The performance of the students will be continuously evaluated based on the choice of the topic, preparation of the topic, referring new research in the area and also discussing the future perspective = 50 marks

B. Final presentation and report writing = 50 marks